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AMERICAN ANTIQUITY

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EDITORIALS

A NEW VOLUME AND NEW OFFICERS . . . With this issue AMERICAN ANTIQUITY goes into its third volume. As we relax for a moment to comparatively examine the numbers of the first two volumes, we believe that we see reflected in the pages a progressively improving spirit of common interest and coöperation on the part of contributing members. Certainly, we see important presentations and interpretations of data that might not have been published save for the medium afforded by our journal. These apparent results seem to justify past labors, and encourage a renewal of efforts in future.

With these few words your editor dams his editorial outflow for this number, gladly yielding the remainder of these editorial pages to one of our newly elected officers: Vice-President William A. Ritchie, and extending to him and to President A. V. Kidder (who will have an editorial word for us in the next issue) on behalf of members of the editorial staff our warmest congratulations and the offer of our coöperative services to the fullest extent during their term of office.

W.C.M.

GREETINGS . . . A new field season is well under way. In many sections of the country archaeologists, professional and amateur, are hard at work in the mysterious earth, each in his "little plot of dust," "careless alike of sunshine and of storm." Within each burns an ardent desire to augment by some discovery, great or small, our knowledge of what man has been and has done in the past. Neither the love of glory nor of gold motivates his arduous and often tedious toil, but rather the elemental urge for social service and the deeply laid love of adventure and exploration with its allied romantic fascination of "old, forgotten, far-off things." Beneath his shell of cold methodology and formal expression the archaeologist is essentially a poet and his life, as reflected against the background of the modern world, is almost ascetical. Like the sage who spoke to Rasselas, he is content "to talk in public, to think in solitude, to read and to hear, to inquire and answer inquiries."

It matters little where circumstance has set the stage for his performance. Ultimately his contribution, if faithfully and intelligently made, will be fitted into the total picture of human activities, for "human history is one history and human welfare is one whole."

It is my earnest wish that this year shall bring the fulfilment of some great hope, the solution of some long perplexing problem to all of my fellow archaeologists who are afield or in the laboratory, and that they shall find themselves at least one step nearer to the goal toward which they yearn.

WILLIAM A. RITCHIE, *Vice- President*

SOUTHWESTERN CONFERENCE—The University of New Mexico, following its annual General Field Session in the Chaco Canyon from July 31 to August 28, is planning an Anthropological Conference at the same site, August 28–30, inclusive. All those who can find their way to the Pueblo Bonito camp may receive board and lodging there for the three-day period.

The conference will be entirely informal, without the presentation of papers, or other prescribed program. The subjects to be openly discussed will depend upon the expressed interests of those participating. It is hoped that ethnologists, as well as archaeologists and geographers, interested in the Southwestern field will be able to attend, since nothing pertaining to the ethnology and human geography of this area has been given consideration at the recent archaeological conferences.

Additional information on the conference may be obtained from Dr. Donald D. Brand, Department of Anthropology, University of New Mexico, Albuquerque, New Mexico.

W. C. M.

ARCHAEOLOGY IN THE SOUTHWEST

FRANK H. H. ROBERTS, JR.[1]

ARCHAEOLOGICAL investigations in the Southwestern field proceed apace. New facts and fancies burst forth in such profusion that the trend of the studies is well-nigh obscured by the complexity of information emanating from the area. The specialists at times find it difficult to comprehend developments. Hence there is little wonder that students and laymen are prone to succumb to a sense of futility when they view the welter of material on the subject. To many the archaeology of the Southwest now seems so involved, so cluttered with minutiae that it has become dull and stupid and can no longer be regarded as the source for a fascinating story of the cultural and material growth of a primitive people. Yet the new chapters being added are even more interesting than those with which most people are familiar. Stripped of pedantic verbiage and technical terminology they reveal a consistent and progressive broadening of the history of the area and foreshadow even more significant results from future excavations.

Because of rapidly changing interpretations and a continual uncovering of more evidence it is practically impossible to present an up-to-date summary of the subject. Before an article can be set in type the unrolling panorama presents new scenes and a shifting viewpoint. There are certain factors which are reasonably static. Established facts remain constant, although they may be amplified or placed in a different light by subsequent discoveries. With these as a nucleus it is possible to make broad generalizations. It is in the field of interpretation, theorization and synthesis that the flux is most apparent. This can be attributed, in some measure, to hasty conclusions based on meager evidence, also, to a desire to depict the whole course of events in the area, including outside contacts and indications of reciprocal influences, from information obtained from a single district or a limited number of sites within a region. Additional facts often upset such conclusions and explode theories developed through too exuberant speculation. The result is that ensuing modifications change the current status of the subject.

The Southwest has furnished and still provides a fruitful field for a study of cultural history. Within the area encompassed in the present day political domains of New Mexico, Arizona, Colorado, Utah, eastern Nevada, the extreme western borders of Oklahoma and Texas, and the

[1] Bureau of American Ethnology, Smithsonian Institution.

great inland basin of northern Mexico, are innumerable traces of former occupation. There are village sites, caves, rock shelters, and ruins of great urban centers representing different stages in the development of a sedentary, agricultural people. In addition there are rock shelters, caves, and camp sites once inhabited by nomadic and semi-nomadic groups. During the eighty-eight years which have elapsed since members of the first exploration and survey parties reported and described these evidences of "an ancient culture" or a "lost race," there has been an ever increasing interest in the area. A tremendous amount of work has been done and there is still much to do. In fact, the possibilities are only beginning to be realized. Out of the extensive body of literature on the subject and from studies based on collections in museums, certain features have become apparent, but their full significance is yet to be learned. On a number of occasions it has been necessary for the workers in the area to get together and discuss these features and the method of their interpretation. From these conferences have come clarified points of view and a more or less general agreement on the questions of classification and correlation.[2]

Greatest attention and effort has been directed towards the problem of the remains of the basic, widespread, sedentary, agricultural, pottery-making culture which are so plentiful in the area. It is only in recent years that work has been done at sites attributable to the nomadic and semi-sedentary groups, and so little is known about them that they still constitute one of the big question marks in the study. Because of the preponderance of information on the sedentary peoples and the fact that the archaeology of the Southwest is generally conceived to relate to that group, they will be discussed first.

The general censensus of opinion is that there were two major provinces in the area. Geographically they are known as the plateau and desert; culturally, as the Anasazi[3] and the Hohokam. Anasazi is a Navajo name for the peoples who built and lived in the ruins which dot the plateau, while Hohokam is the word used by the Pima to denote the ancient ones inhabiting the desert regions. What may eventually prove to be a third province is one which hitherto has been thought to represent a regional variation of the Anasazi. There is a possibility that it may emerge as a subpattern resulting from the fusion of very early Hohokam and Anasazi in a peripheral area, but for the present it will be regarded tentatively as a separate entity and listed as the Mogollon.

[2] An extended discussion of these conferences will be found in Roberts, 1935a.

[3] A name recently proposed by Dr. A. V. Kidder.

This is the name of a prominent range of mountains in the district where the remains are found.

ANASAZI

The Anasazi, better known by the names of the subdivisions Basket Maker and Pueblo, is considered a cultural unit with several stages in its development. Its remains are found in the regions of the San Juan River, the Rio Grande, Upper Gila and Salt rivers, the Little Colorado River, most of Utah and a portion of eastern Nevada. The general view is that nomadic occupants of the plateau, those who are considered the progenitors of the later peoples, took up agriculture, having obtained corn and a knowledge of how to plant and cultivate it. Whence this product came or how it reached them is not known, although it is supposed that it was introduced from the Mexican area to the south. Because of its inherent nature the corn-growing industry imposed a more sedentary existence upon the people. As better methods of cultivation brought larger harvests, it became necessary to provide storage places for the surplus grain. The first definite knowledge of the people comes at this period. Evidence that they were abandoning their former mode of life is found in the lower levels of dry caves. The latter show that they served as temporary shelters and as storage places. In the floors of many such caves are circular or oval pits, in many cases lined with slabs of stone, that are the remains of the lower portions of granaries. The upper parts were of pole, brush and plaster. Examples have been found with the superstructure still in position over the pit, providing definite information on the nature of the construction.

The granaries were frequently put to a secondary use; they served as sepulchers and, as has been the custom in many cultures, objects used in life were buried with the deceased. The material from these graves, supplemented by articles found in other situations in the cave deposits, furnishes information on the physical characteristics of the people and of their arts and industries.

Because of the extreme aridity in the Southwest, conditions are unusually favorable for the preservation of objects which otherwise would rapidly fall into dust. As a result, specimens from the portions of caves where no moisture has penetrated enable the student to draw a fairly complete picture of the times. The evidence shows that the people were skilled makers of baskets, woven bags, ropes, head bands, game snares and large nets for catching small animals. Their weapons were a short javelin, hurled by means of a spear-thrower or atlatl; short, curved clubs of wood; stone knives; and clubs fashioned from elk antlers.

They also had wooden planting sticks, curved sticks for use in dressing skins, wooden scoop-like objects for digging, and bone tools for weaving. Ordinarily the clothing was limited to a short, apron-like cord skirt for the women, probably some form of "gee-string" for the men, and sandals for the feet. When the bleak mesa tops and canyons were swept by chill winds or occasional storms, the meager body covering was supplemented by fine robes of fur-cloth.

Dwellings at this stage must have been of an extremely perishable nature as no traces of them have been found. It is possible that they did not have definite domiciles, depending for the most part on the caves and other natural shelter. However, they did not occupy the caves continuously, since accumulations of refuse which would have resulted from permanent residence are lacking. It would seem that they must have had some sort of structure, but one so flimsy in construction that no remains have been preserved. The first efforts at building of which there is actual knowledge were those directed toward the development and erection of substantial granaries.

Studies of the skeletal remains have shown that the group was not wholly uniform as to physical type. There was a blend of at least three basic strains and a visitor to the region might well have observed three types of individuals. Possibly the most numerous were those with a comparative smoothness and symmetry of head form, medium to long in length, rather narrow faces which tended to be a little long, weakly developed jaws and chins, and medium to narrow noses with elevated bridge. A second group was composed of somewhat more robust and rugged people with long heads, receding foreheads and prominent brow ridges, shorter and broader faces with more noticeable cheek bones, and medium to broad noses with submedium bridge. The third type had long but smaller heads, somewhat swollen foreheads, inconspicuous brow ridges, very broad noses with flat bridges, moderately developed cheek bones and weak chins. The people in general were predominantly non-Mongoloid in character. It is not thought that separate groups comprising each of these types migrated to and mixed in the Southwest, but that the people who spread into the New World from northeastern Asia were racially mixed and that their descendants in the Southwest exhibit the forms discussed because of the segregation of features in occasional individuals.[4]

In the upper levels, deposits of more recent date, in many of the caves where evidence for the early stage of the plateau peoples was

[4] Hooton, E. A., 1930, pp. 355–362.

found, were manifestations of their progress. The remains of crude houses indicate the adoption of a definitely sedentary mode of life, and also that the organization of regular communities was under way. Vestiges of these villages are found in the open, on the mesa tops and canyon floors, as well as in the caves. There is some question concerning the origin of these houses. Some data suggest that they resulted from constant improvements in the methods of granary construction and the attendant discovery that a fairly good dwelling of the pit variety could be built by enlarging the granary pit and heightening the superstructure. Yet the fully developed houses so strikingly indicate a relationship to the basic earth lodge type widely distributed in both the New World and northeastern Asia that it is possible the form should be attributed to a diffusion from the Old World rather than to local developments.

The first houses, although crude, were probably quite comfortable. They consisted of a circular, oval, or rectangular excavation roofed with a truncated pyramidal superstructure of poles, brush and plaster. This superstructure was supported by four upright posts embedded in the floor near the sides of the pit. The walls of the excavation were generally reinforced by a lining of stone slabs or a wainscoting of small poles, although sporadic examples are noted where neither was used. Mud plaster was then spread over the walls. A hole in the center of the flat portion of the roof permitted the escape of smoke from the fire, which was built in an open pit near the center of the room. An antechamber and passageway, usually located at the southeast side of the house, provided the means of entrance to the structure. Several storage granaries, of the type already described, were usually placed close to the dwelling. A number of these domiciles, with accompanying storage bins, were grouped in an irregular cluster to form a village.

During the period when house-building experiments were under way the beginning of a new industry, pottery making, appeared. This is usually considered another introduction from the south, although evidences for an entirely local development are so strong that many believe it was only the idea which reached the area. The first crude containers were fashioned in basket molds and could not be considered true pottery as they were merely dried, not fired. Ultimately it was learned that the secret of making useful clay vessels lay in firing them. From that time on ceramics became a major element in the complex and baskets less and less important, although they continued to be made.

Later the bow and arrow began to replace the spear thrower, several

varieties of corn were grown where previously there had been but one, beans appeared in the list of agricultural produce, and an occasional feather-cloth robe was made. There was a change of sandal types. The appearance of the bow and arrow may in some manner, not yet determined, be correlated with another factor, one which was to have a marked influence on future developments. New peoples were drifting into the region and it is possible that they were the bearers of this different kind of weapon, although it apparently preceded them as a diffused cultural trait.

This new group did not sweep into the plateau as an invading horde, but made a gradual penetration in successive small bands. The presence of other elements in the population is shown by the nature of the physical remains of the people. They include, in addition to the types already described, a larger, more robust group with distinctly Mongoloid broad heads. Subsequent adoption of the practice of cranial deformation, a flattening of the occiput, introduced a feature which became characteristic throughout the later stages. Remains of these new people are in the minority in older sites, show greater numbers in levels of more recent date, and eventually become predominant, although the older physical types never completely disappeared.

The immigrants seemingly brought little with them beyond the bow and arrow, possibly the grooved ax, and a distinct capacity for cultural development. They took over, changed and adapted to their own needs the material culture of the older inhabitants. The mixing of the two peoples apparently produced a vigor which was an important factor in carrying them on to the high degree which sedentary life reached in the plateau province. This was not an immediate accomplishment, however, as the earliest phase was one of transition and instability. There undoubtedly were clashes of varying severity between the established inhabitants and the "aliens." In some cases the meeting was probably violent and the older peoples either summarily killed or driven out to locate elsewhere. In other localities the first contacts were comparatively mild incidents accompanied by an intermingling of the old and new. The older groups held on for some time in peripheral sections of the province, notably the northern, western and southern borderlands.

Out of the stress and turmoil several new features appeared and the foundations for future developments became established. Cotton was introduced and fabrics made from it assumed a prominent place in the material culture. The wild turkey was domesticated; previously the dog

had been the only tamed creature. The grooved ax became an important implement. There was a distinct improvement in pottery making accompanied by the appearance of stylistic fashions in the character of ceramic decoration.

In the nuclear parts of the province the single-room, semi-subterranean dwellings gave way to structures which had only slightly depressed floors instead of pits. The major portion of the house was above ground and had several contiguous rooms. In some cases the walls were of pole-and-plaster (jacal) construction, and in others horizontally-laid stones were employed. These were followed by houses with masonry walls, built entirely above ground, containing six to fourteen rooms. They were a single story in height. The rooms were placed in one long row, a double tier, an L-shape, or in the form of a rectangular "U." These dwellings are called the one-clan or unit type.

In the peripheral districts pit-houses continued in use for some time, although the form was modified. The pits were dug deeper and entrance to the chamber was by means of a ladder through the smoke hole in the roof instead of by an entryway at one side. The latter was retained, however, in reduced and altered form and functioned as a ventilator. These structures were eventually replaced by others approximating the unit type, although they did not reach as high a degree of excellence as those in the nuclear districts. In the south and west, pole-and-mud houses and irregular agglomerations of rooms whose walls were formed from large quantities of adobe mud and boulders constituted the living quarters.

The new type dwellings necessitated some provision for a place in which to hold the religious rites and ceremonies that had previously been performed in the old circular domiciles. Instead of changing the rituals to meet the requirements of the new houses, each group provided one of the old style structures. It was usually placed at the south or southeast side some distance from the dwelling. In the course of time these ceremonial chambers became more specialized and ultimately developed into what is called the Kiva. It did not become as highly developed in the peripheral districts, and in some sections the circular form is entirely missing, yet its purpose was served by analogous rectangular structures.

During the period when these changes were taking place the people lived in small villages scattered throughout the province. Then a new trend set in. Large communal centers became the order. This was accompanied by the erection of great terraced buildings with many rooms,

structures with second, third, fourth, and sometimes even fifth stories. The ceremonial chambers were included in the main block of the building and their former subterranean character was simulated by filling with earth the spaces between their circular walls and the rectangular ones enclosing them.

The rise of these urban communities was due more to an ever-growing tendency on the part of the people to abandon the outlying small houses and to concentrate in various centers, than to a sudden and marked increase in population. The motivating force behind the movement is not known. It was probably a combination of factors. Severe drouths occur periodically in the Southwest and such an occurrence may have made some districts so unproductive that the occupants were forced to join their kinsmen in sections where conditions were less rigorous. In order not to encroach too much on tillable land the dwellings were consolidated and evolved into the typical apartment house of the period. Coupled with this was a constantly increasing pressure from the nomadic tribes of the borderlands. Drouth conditions would make marked inroads on the supplies of wild fruits, seeds, nuts, or even game, and small unprotected villages with reserves of corn and beans would be tempting plunder. All around the peripheries of the province are evidences of unit structures which had been pillaged and their occupants slaughtered. These indicate that raids did occasionally take place. Hence the desire to gather in populous centers as a means of self defense may have been an important element in the trend of affairs.

The tendency toward specialization, adumbrated in the small house stage, became more marked with the concentration of people and finally reached a climax when the elements in the material culture crystallized into forms peculiar to each center. The large towns thrived for a time and then began to collapse. The causes for this phenomenon have not been determined but unquestionably there were several. Many large ruins show definite attempts at fortification, as though encroaching and plundering nomads were again becoming troublesome. There may have been internal discord and factional strife, conditions not unknown in the modern towns, and large groups moving out to settle at some other place as a consequence. Added to this were the recurring drouths, and a series of prolonged crop failures may have reduced the resistance of the people to such an extent that they gave up the struggle and started off in search of better locations. That the abandonment of some of the centers can not be attributed wholly to drouth conditions is in-

dicated by the fact that a number were deserted during an interval when the weather situation was favorable.

Irrespective of what the actual causes may have been, there was a gradual subsidence from the former cultural peak and an era of instability and migration set in. The northern part of the province, that traversed by the San Juan and its tributaries, was deserted. New villages and communities began to develop along the Rio Grande and the Little Colorado. Arts and industries took on new life and the people were definitely headed toward a renaissance when the arrival of the Spanish explorers and subsequent conquest put an end to the further development of the native cultural pattern.

To facilitate study and simplify discussion, Southwestern archaeologists adopted a system of nomenclature by which the sequent stages of the Anasazi, as outlined in preceding paragraphs, may be designated. This is called the Pecos Classification. The developments are grouped under two main subheadings, Basket Maker and Pueblo. There are three subdivisions in the first and five in the second. They are generally designated by the name followed by a number. Basket Maker I denotes the original nomadic occupants; Basket Maker II, the first agriculturists; Basket Maker III, the initial house-building, pottery-making phase; Pueblo I, the arrival of new peoples and attendant transitions; Pueblo II, the small house, unit type, period; Pueblo III, the large urban centers; Pueblo IV, the period of redistribution and springing up of new communities; Pueblo V, the modern villages.[5]

Because of some confusion arising from the implication of chronology embodied in the numerical qualifiers, the writer suggested a new terminology in an article in a recent issue of the *American Anthropologist*.[6] Several reports since its appearance have used the terms, to the surprise and embarassment of the writer, and for that reason it may be well to repeat them. Since the Basket Maker I stage is wholly postulated and no remains attributable to it have been found, it was suggested that it be dropped. Basket Maker II was shortened to Basket Maker and Basket Maker III became Modified Basket Maker, showing that while it had the same basic features there had been some change. Pueblo I and II were combined under one heading and designated Developmental Pueblo. This name was used by Mr. E. H. Morris prior to the adoption

[5] For more extensive treatment of this subject and references to sites illustrative of the periods see Roberts, 1932.

[6] Roberts, 1935a.

of the Pueblo I and II nomenclature. It indicates that the complex was in the evolutionary stages leading up to the maximum development and avoids difficulties caused by the fact that one or the other was missing in some sections. This is particularly true in peripheral precincts where Pueblo I sometimes held on until replaced by III, or where Basket Maker III occasionally persisted until it graded into Pueblo II. Pueblo III is listed as the Great Pueblo, an alternative title in the original classification. The term Regressive Pueblo was suggested for Pueblo IV. While indicative of the general nature of the period as a whole, it is not entirely satisfactory and, as Dr. Kidder has pointed out, tends to be misleading because the highest stage of development was not reached in the Rio Grande and Little Colorado districts until this phase. A better solution, one which was mulled over for several months and then discarded in favor of a shorter series of names, would have been to employ one additional term, Renaissance, to denote the major portion of the fourth period when the greatest strides were being made along the Rio Grande and Little Colorado. Regressive would be restricted to the interval when the abandonment of the northern part of the province was under way and the cultural pattern was in a state of flux. Thus the Pueblo series would have read: Developmental, Great, Regressive, Renaissance, and Historic. The latter term was a choice for Pueblo V proferred by the original classification.

Dr. Kidder has recently written, however, in discussing the question of formal classifications: "They are useful when our task is to reduce to order, and to bring meaning into, a mass of more or less disconnected data. But as archaeological findings group themselves to form a historical picture, systematic rigidities are better eschewed."[7] Hence further consideration of the subject is probably gratuitous. Yet when it is recalled that in our own history, which is thoroughly documented, dated, and on the whole a minutely detailed picture, descriptive names and phrases have a definite place, comparable designations do not seem entirely redundant in Southwestern archaeology. In a broad sense they fulfill the purpose of characterizing definite elements in the picture in the same way that "colonial period" or the "era of westward expansion," or the "gay nineties," place features in their proper perspective in our own culture.

Several diagnostic traits are used in identifying the various stages. The same traits apply whether the Pecos Classification or the one just discussed is used. For the two major groups, Basket Maker and Pueblo,

[7] Kidder and Shepard, 1936, p. xviii, note 3.

skeletal material is thought significant, although elements in the material culture are so well differentiated that they probably furnish a more reliable criterion. Components in the complex which are considered indicative of the stages are: village types, architecture, textiles, baskets, sandals, pictographs, stone and bone implements, kinds and styles of ornaments, and pottery. Pottery is considered to furnish the most abundant, reliable, and convenient means of identification, with the culinary wares the simplest for sequence determinations.

There is a widespread impression that the classification rests primarily on ceramics, but such is not the case. Perhaps the reason that pottery has received so much attention[8] is due to the fact that it is characterized by easily noted differences in style and form and that it was an exceedingly sensitive element from the standpoint of variation both in time and place. In the form of potsherds, as surface material, it is readily obtainable without the expenditure of much effort or money. Considerable recent work has been of the survey type with potsherd collections as the main objective. Numerous current ceramic considerations are based on such material, which accounts for the prevailing thought that pottery is the *sine qua non* of Southwestern archaeology. Characteristic traits of various elements in the several stages of the Anasazi were discussed at some length in the *American Anthropologist* article already cited and need not be described in detail here.

Evidence for the sequence was obtained mainly from excavations. The most important type of proof was that of the stratigraphic relationship between different forms of the elements in the complex. Correlations between sites and districts were worked out through the study of trade objects and their positions in the local sequences. The entire structure had been erected on this archaeological foundation when a new method became available, making possible absolute rather than relative dating. This was dendrochronology or the tree-ring calendar developed by Dr. A. E. Douglass, and described by Dr. E. W. Haury in Vol. 1, No. 2, of AMERICAN ANTIQUITY.

Dendrochronological dates showed that the stratigraphically developed sequence was correct in the main outline, that the relative ages of numerous large ruins and village sites, even of remains in different districts, agreed with the new chronology. A great discrepancy was found, however, between the tree-ring dates and previous postulations.

[8] There are some 200 names for types in current use and new ones are being added daily. See Hawley, 1936, for the list as it stood before last summer's work contributed its quota.

The dates demonstrated that the unfolding of the cultural pattern had been a short and rapid one. Instead of the estimated thousands of years, only hundreds were involved. At the present time it may be said that Pueblo I had its beginnings toward the end of the 7th century; Pueblo II extended from the latter part of the 9th to the end of the 10th; Pueblo III, from the end of the 10th to the middle of the 13th; Pueblo IV, to the beginning of the 18th; and the last stage, Pueblo V, from 1700 to the present. The date for the beginning of the Historic period is placed at 1700 rather than at 1540 when Coronado's expedition penetrated the area, because it was not until after the reconquest following the Pueblo Revolt, 1680–1696, that the influence of European civilization began to exert full pressure on the native culture. Of course there is no sharp dividing line between periods. Due to peripheral lags and other factors some stages persisted longer in certain districts than in others so that the periods of years involved are only approximate.

Dendrochronological studies, in addition to furnishing dates for ruins, also supply information on the occurrence of drouths and suggest explanations for certain disturbances noted in the cultural history. There was a drouth in the 790's; one from 900 to 904; another about 924; a short, although severe one about 980; another in the decade 1090 to 1101; a short one at 1131; followed by another at 1217. The period of twenty-four years from 1276 to 1299 was the most severe of all. There were intervals when conditions were not entirely favorable. The early part of the 11th century, from 1005 to 1044, was noticeably below normal in this respect, although it could hardly be called an actual drouth.[9]

Dates for a number of the drouths correspond to definite phenomena in the Anasazi pattern. The dry period at about 980 correlates with the trend toward concentration in urban communities, but the full force of the movement did not materialize until the subnormal 1005 to 1044 period. This is particularly well illustrated in the Chaco Canyon in northwestern New Mexico where there was a great burst of building activity during that interval. That some other factor was also involved, however, is indicated by the fact that the greatest expansion in that center came in the score of favorable years immediately following. Other sections did not receive their main impetus, apparently, until the 1090–1101 drouth. The greatest concentration in the Mesa Verde district seems to be subsequent to this decade of moisture deficiency, and most of the dates from the ruin at Aztec, New Mexico, fall within the range 1110 to 1121. The great drouth, 1276–1299, was undoubtedly an impor-

[9] Douglass, 1935, pp. 48–49.

tant factor in the abandonment of some of the centers and the appearance of new communities farther south; yet several had unquestionably been deserted for some time prior to this catastrophe. When more dates are available and additional information has been obtained from several districts that are not too well known at present, an interesting study of the effects of weather and the movements of peoples can be developed. Present evidence only hints at the possibilities.

The question of classification is more complex than that outlined in preceding pages. Augmenting the general system are many others. Some workers use a supplementary one composed of roots, stems, branches, and phases that cuts across the stratification system. The roots are based on the stocks from which the later peoples are believed to be derived. The stems relate to major geographical features. The branches deal with minor cultural subpatterns. The phases concern variations in the branches, both in time and space. Then there are the classifications for elements in the complex, for minor variations in restricted precincts, and others pertaining to small local districts. These must be correlated not only with the main classification but with each other as well, and it is in that field that the subject becomes obscured by minutiae. The broad, simple outline is sufficient, however, to indicate the general features of the province for the average reader.

HOHOKAM

The Hohokam or desert province has attracted serious attention from archaeologists only in the last decade, although there was considerable sporadic work in the area for many years. It is only since 1931 that it has been accepted as a separate division in the Southwest, and, in comparison to the Anasazi province with its mass of data, the information on the cultural pattern is quite meager. Efforts of investigators have produced good results in the last five years, but much more excavated evidence is essential before more than a broad outline can be sketched.

The province lies in the territory extending from the Colorado River on the west to approximately the New Mexico line on the east, from Flagstaff, Arizona, in the north to northern Sonora on the south, with its center lying in the Middle Gila basin. The northern boundary follows roughly the 35th parallel from the Colorado, swings slightly northward to include the Flagstaff section, thence southeastward across Arizona, conforming for the most part to the great diagonal ridge sometimes called the "Verde Breaks" or the "Mogollon Rim," and con-

tinues along the Gila Mountains as far as Safford, Arizona. The eastern boundary extends from Safford southwestward to the San Pedro Valley and on to the Santa Cruz Valley south of Tucson.

Until recently it was thought that the Hohokam entered the Southwest as an already established pattern, although it continued to evolve in its new setting. Now, because of the inability thus far to find a source for it, it is being regarded mainly as an indigenous development. The investigators also think that the Hohokam cultural pattern flowed outward to affect peripheral areas, rather than receiving its impetus from an exterior source. Actual beginnings of the pattern have not been discovered as yet, but there is a possibility that it grew out of a very generalized basic form which has not been recognized. Lack of evidence along this line can not be considered as significant at this time because the amount of work done is not sufficient to warrant placing emphasis on negative features. Investigations had been carried on in the Anasazi province for almost half a century before the Basket Maker III and Pueblo I stages were discovered. In view of that, it is hardly probable that five years of careful work in the Hohokam has uncovered all the evidence for that province.

In its earliest known phase the subsistence pattern of the Hohokam was agricultural. This is indicated by shaped metates, or milling stones, and by the dearth of animal bones in the refuse accompanying the sites where remains are found. The people lived in very large houses of squarish form, structures sometimes as much as forty feet across. The lower portions were excavated into the sub-soil. They were not actual pits, but depressed floors. The superstructure had walls of poles, brush and mud plaster and was supported by four main posts set well in from the corners of the house. There was a vestibule entrance at one side. The people made a thin, plain pottery and a red ware but no painted vessels in the earliest phase. Flood-water irrigation was used for growing crops. The dead were cremated and the ashes disposed of either in pits or trenches. For this reason there is no evidence on the physical type of the people. As time went on there was a notable reduction in the size of the house and the form became rectangular. The shallow pit and vestibule features were retained. Pottery with painted decoration came into the complex and there were other signs of progress.

As the pattern developed other changes were made. Houses continued to conform to the same general rectangular, shallow-pit type but new features were incorporated and some constructional changes were introduced. Instead of four main support posts there were two, placed

near the ends of the room and supporting a ridge pole. A series of smaller uprights around the edges of the room carried stringers which formed the outer framework or plate. The main roof timbers extended from the central ridge to the outer frame and the wall poles slanted from it to the ground around the edge of the pit. The outer covering was of reeds, brush and mud plaster. The interior was not plastered but lined with reeds. In some cases the floor was raised above the bottom of the pit on stone posts. Each of these dwellings constituted a unit in the village. The villages were scattered over the broad, semi-arid valleys of the province. Fields were irrigated by the ditch system. The dead were cremated and the ashes disposed of in pits. There was considerable advance in the ceramic and other industries. The whole aspect was one of unity and a standardization of artifacts.

The following stage was marked by new features. There was a withdrawal from the more outlying precincts and a greater concentration of peoples in a smaller area. The houses were of two types. One consisted of a rectangular, shallow pit covered with a superstructure supported on four main posts placed near the corners of the pit. The ridge pole type was supplanted by a form similar to that described for the early stages, but these dwellings lacked the vestibule entrance. The other was a rectangular house, entirely on the surface, with a framework covered with grass and daubed with mud. In some cases there were contiguous rectangular surface houses that had adobe walls with sporadic stones in them. Also, some of the villages were enclosed in a compound wall. These last two features are not typical, however, appear late in this stage of development, and are usually regarded as traits presaging the arrival of intrusive peoples. There was an improvement and enlarging of the irrigation systems. The dead were cremated, but the ashes were placed in urns instead of pits. There was a further development in pottery with definitive changes in forms.

Associated with this stage, and possibly dating from late in the preceding one, is a feature which has only recently been recognized; namely ball courts, or at least the remains of structures so similar to the ball courts in Middle America that they may justly be considered as belonging in the same category. The significance of these structures has not been determined, but they imply some connection with the Mexican area to the south. While no similar structures have been reported from northern Mexico, it is known that as late as the latter part of the 18th century the people there were playing a game similar to that played in the courts in the regions farther south.

The next stage was interesting in that it was marked by an invasion from the borders of the plateau province, by some of the Anasazi. The two peoples seemingly lived side by side, yet kept their cultural patterns distinct. The association apparently was of insufficient duration for a borrowing or hybridization of characteristics. Pueblos were built in Hohokam communities. The latter continued to occupy shallow pit structures and one-story surface houses built of poles, brush and mud. The villages were enclosed in compound walls. The Hohokam cremated their dead and placed the ashes in urns. The Anasazi interred the deceased in accordance with the custom that prevailed throughout the entire span of their cultural history. During this stage two distinct groups of pottery were in use; one the Hohokam, the other the Anasazi. The great irrigation systems of the Gila and Salt river valleys attained their maximum during this stage.

The northern people withdrew from the area, after a time, while the Hohokam continued to occupy their long established hearths. This penetration and withdrawal, on the basis of comparative studies between the Anasazi material left in the Hohokam province and dated sites attributed to the particular group involved, have been placed at 1300–50 and 1400–50 A. D.[10] The entire cycle probably was encompassed within a single century.

Following this is a stage which is largely postulated. Workers in the province admit they know nothing about it. At one time they thought certain ruins and artifacts could be correlated with a definite horizon subsequent to that of the maximum development of the cultural pattern, but they now feel that such is not the case. In general it may be said that the houses were possibly of pole, brush and clay construction, that the dead were cremated, and that the pottery was mainly plain ware resembling that of the modern Pima and Papago.

The final horizon is that of the present day Pima and Papago. It is postulated that these peoples are the descendants of the older Hohokam, or possibly represent a mixture between them and later groups migrating to the region in comparatively recent times. These are moot points, however, and many ethnologists, particularly some who have been more or less interested in the Pima and Papago, do not agree with the archaeologists. These present day peoples bury their dead, build pole, brush and clay houses, circular in form for dwellings, rectangular for council houses, and make a distinctive form of pottery.

The various divisions in the Hohokam are designated by a set of

[10] Gladwin, 1935, p. 254.

names. The first stage is called the Pioneer. The second, that of the ridge-pole house, the beginning of the ditch system, and the standardization of artifacts, is named the Colonial. The next horizon with its two forms of houses, occasional compound wall, and urn burial of ashes, is known as the Sedentary. The period marked by the intrusion of Anasazi peoples is denoted the Classical. The following, practically unknown stage is called Recent; in some of the older reports it was listed as the Degenerate. The Pima and Papago grouping is known as the Modern period.

The Colonial and Sedentary periods were characterized by a widespread distribution of village sites, although the Sedentary covered a somewhat smaller area and was missing in the southern periphery. The Classic spread over the Gila and Salt valleys, but was not present in the west where the Sedentary developed into Modern. The Modern is found only in the southern parts of the domain. Knowledge of the Pioneer is restricted to evidence from a single site, Snaketown, in the vicinity of Phoenix. Since the results of the work there have not been published, it is not possible to give any of the significant details. In addition to the classification system just described, the Hohokam has the supplementary ones mentioned in connection with the Anasazi. The root, stem, branch and phase plan started with the workers in this field and is more rigidly followed by them than is the case for the Anasazi.

There are no dendrochronological dates for the Hohokam. The timbers used in house construction were of varieties of wood not adapted to tree-ring studies. The determination of periods depends in a large measure on pottery types. As a matter of fact, in the beginning the whole structure was predicated mainly from potsherd surveys. It has since been augmented by evidence from a number of excavated sites and other elements in the material culture have been shown to differ in the various stages. Some dates can be suggested on the basis of trade objects, as in the case of the Anasazi penetration, but on the whole the picture is in much the same status as the Anasazi was prior to the development of the tree-ring calendar. The time factor is largely postulated.

The main differences between the Anasazi and the Hohokam may be briefly summarized. The Hohokam practiced cremation; the Anasazi, inhumation. Throughout the course of its history the Hohokam retained the rectangular single-unit house of pole, brush and plaster construction. The Anasazi progressed from the circular or rectangular single-unit dwelling of poles, brush and plaster to multi-storied communal houses

built of stone. The Hohokam progressed from flood-water irrigation to extensive canal systems for supplying their crops with water; the Anasazi depended mainly on flood-waters but in some sections did employ series of small ditches. The Hohokam had a three-quarter groove, long-bitted ax; the Anasazi, one with a short bit and the groove extending all the way around. The Hohokam had extensive carving in shell, which was rare in the Anasazi. The Anasazi had the domesticated turkey; the Hohokam apparently did not. The pottery made by the two patterns differed in certain respects. Both groups used the coiling method but the finishing processes varied. The Anasazi smoothed the surfaces of their pots with scrapers and polishing stones; the Hohokam completed theirs by employing a paddle and anvil. Whereas the Anasazi painted wares over a long period of time were of the type with black designs on white backgrounds, followed by a series of polychrome forms, the Hohokam had red designs on a buff background.

The questions of relationship, individual and reciprocal influences, and chronological correlations between the Hohokam and the Anasazi are prominent in all present considerations of the Southwest. More stress has been placed on this phase of the subject than is warranted by available evidence. The best that can be said at the present time is that the periods in the two provinces correlate roughly. This has been indicated by the finding of Anasazi potsherds in borderline districts. Pueblo I sherds have been reported from Colonial sites, Pueblo II-III fragments from Sedentary sites, and Pueblo III–IV from Classic. A few sherds called Basket Maker III have been found in Colonial sites, but these pieces of pottery are debatable in character and would unquestionably be considered as Pueblo I by many of the workers in the Anasazi province. Those having the closest approximation to the Basket Maker III form were recovered under circumstances which make their significance very dubious. They were on the surface at a Colonial site where Pueblo I sherds were present two to four feet beneath the surface.[11] This indicates some reversal or disturbance of deposits and even raises the question as to how much importance should be assigned to the Pueblo I pieces. No Hohokam fragments have thus far been reported from a Basket Maker III site and they are not present in Pueblo I remains in nuclear parts of the province. In fact, they are noticeably absent from all horizons except in borderline precincts.

The two patterns overlap to some extent along the hazy boundary line between the provinces. In the Flagstaff area, houses attributed to

[11] Haury, 1932, p. 128.

the Hohokam have been found in the Pueblo II horizon,[12] and Colonial and Pueblo I potsherds were present in some of the pit-houses.[13] Although this is not stated, it is presumed that these were Pueblo I structures. The Flagstaff area is considered as peripheral to, and somewhat backward in the greatest cultural developments at that time.[14] Hence the association may represent a late chronological position in both the Colonial and Pueblo I. Cremation burials are present in the district east of Flagstaff[15] and a number of ball courts have been reported from that section.[16] In the Verde Valley there seems to have been some commingling of the two and a possible fusion which produced a subpattern.[17]

With all these factors in mind it can be said that Pioneer and Basket Maker III, Colonial and Pueblo I–II, Sedentary and Pueblo II–III, and Classic and Pueblo III–IV, respectively, are approximately contemporaneous. More specific or detailed conclusions are not warranted on present evidence, particularly since the time element for the earlier Hohokam stages is postulated and, as was the case in the Anasazi province prior to dendrochronology, the guesses may well cover too great a period of time.

THE MOGOLLON

The Mogollon pattern seems to center in the San Francisco and Mimbres river valleys in southwestern New Mexico, although traces of it are found extending for a considerable distance in all directions. Knowledge of the culture is based on extensive excavation in two sites: the Mogollon and Harris villages, investigations in two other sites, and on comparisons between elements from these places and similar ones in other localities. The basic feature is that of a sedentary people dependent in about equal proportions on agriculture and hunting for their food supply. As in the case of the Anasazi and Hohokam, the unfolding of the cultural pattern passed through several phases or stages. In some cases the developments seem to have been local; in others, introduced or influenced from outside sources.

The first dwellings in this area were deep pit-houses. In the earlier form they were rounded; later they became rectangular. The first type of house had a pole, brush and plaster superstructure supported by a

[12] Hargrave, 1933, appendix, p. 75.
[13] Hargrave, 1932, pp. 6–7.
[14] McGregor, 1936a, p. 50.
[15] Hargrave, 1932, p. 6.
[16] McGregor, 1936b.
[17] Gladwin, 1930.

single central post and a ring of uprights around the edge of the pit. The following house form was rectangular with a ridge pole or gable type of superstructure in which there was some inconsistency in the placing of the secondary supports. The third type was also rectangular, but the superstructure was supported by upright posts placed near the corners and side walls. Each of these house types had a long, sloping side entrance.[18] Associated with these dwellings were other structures which have been considered as analogous to the northern ceremonial kivas, but they have not been given that name because most of the features common to the kivas are absent. The ceremonial houses were first round, then rectangular. There was a decided lag in the change from one to the other in comparison with the trend in dwellings. Little information was obtained concerning the type of superstructure or interior furnishings of these buildings.

Following the third type of dwelling there were several short-lived house forms: masonry-lined pits, contiguous masonry-lined pits, and houses with very shallow pits, which gave way rather abruptly to many-roomed, although single-storied, pueblo type houses. After this stage the district was abandoned for a time and then occupied by another pueblo-building group, with a mixed cultural pattern.

The sequence in house forms was established through ceramics, stratigraphy, and other forms of evidence. In the earlier phases circular, undercut, storage pits accompanied the houses. Later these became rare and were not so well made.

Disposal of the dead was usually by inhumation, the graves being scattered among the houses in the early stages, later being placed beneath the house floors. The latter was the common place for interments when the many-roomed communal houses were the vogue. Some cremation was practiced in the district in all stages. At first they were characterized by pit burial of ashes; later, by the use of urn containers, a trait paralleling that noted for the Hohokam. Because burial was commonly practiced, however, it is possible to gain information on the physical nature of the people. In the early stages they were a type with low-vaulted, undeformed, round heads. Later, when the pueblo type houses were built, a type with high-vaulted, deformed, round heads appeared.

Other items in the material culture complex show features comparable to the stage differences in the houses. Pottery was made by the coiling method with the finishing process that of smoothing and rub-

[18] Haury, 1936a, fig. 26, p. 83.

bing. As in most sections in the Southwest, there were marked variations in some wares and little change in others. The greatest variations were in the painted vessels and the developments were governed by both internal and external factors. When the full pueblo stage was reached the resultant forms demonstrate a fusion of Mogollon, Hohokam, and Anasazi traits. In the early stages the character of the pottery was more like that found extending eastward than it was like either the Hohokam or the Anasazi. Certain forms of ceramic treatment which were widespread over the central and southern parts of the United States are present in the early Mogollon, but the evidence thus far available does not warrant correlation with any specific type.[19] A complicating factor is that the Texas material with which it is comparable appears to be later than that of the Mogollon.

There are changes from period to period in pipes, metates, mauls, bowls and other artifacts made from stone. Some of the variations indicate a normal development of one type from another, but in a few cases the differences are so pronounced that they suggest an importation. Some introductions came from the Hohokam; others, from the Anasazi. Shellwork was rather rare and limited in variety in the early stages, but later became more abundant and diversified. One type of notched awl, is considered as peculiar to the bonework of the Mogollon.

The various stages or phases in this province have been designated Georgetown, San Francisco, Three Circle, Mimbres, and Animas. Because of the abrupt change in house types, as well as some marked differences in ceramics, it is thought that there may be a break between Georgetown and San Francisco; that there is a phase which thus far has not been recognized or for which evidence has not been found. The true Mogollon pattern is included in the Georgetown and San Francisco. In the Three Circle is found the beginning of Hohokam and Anasazi influences that culminated in the Mimbres, a pattern governed by a coalescence of Mogollon-Hohokam-Anasazi traits. When the province was deserted at the end of the Mimbres phase, the people seemingly moved south and fused with other groups in northern Chihuahua where they contributed to the developments exemplified by the well known Casas Grandes. The group which appeared subsequently in the province, the Animas, apparently came in from the north and west and were fully developed at the time of their arrival.

Dates from a number of the San Francisco houses show that they were built at the very end of the 9th century and beginning of the 10th.

[19] Haury, 1936b.

The years 896–908 A. D. were the cutting dates for the timbers used.[20] These structures have been considered as representing the end of the stage. This would place Three Circle in the 10th century. Evidence suggests that the Mimbres appeared early in the 11th and reached its close toward the end of the 12th. The Animas, on the basis of its pottery as dated elsewhere, would fall between 1300 and 1400, indicating that the movement was approximately synchronous with the Anasazi penetration into the Hohokam province.

It has been suggested that the basic Mogollon was possibly contemporaneous with Basket Maker III, that Georgetown and San Francisco correlated with Pueblo I, Three Circle with Pueblo II, Mimbres with Pueblo III, and Animas with Pueblo IV. This is based on the San Francisco tree-ring dates and on potsherds of northern origin. These northern sherds present an interesting side-light on the question of trade pieces occurring in an archaeological site. In the fill in the San Francisco houses at Mogollon village, those built in the 896–908 interval were typical Anasazi fragments identified as a late Basket Maker III type (the writer would unhesitatingly call them Pueblo I). In the nuclear part of the province where this type developed, it dates *circa* 750 (probably earlier, because by 777 it had been replaced by the fully developed subsequent form) and in some of the peripheral precincts was associated with houses built between 800 and 825. At the Harris village in a Three Circle house, the phase subsequent to San Francisco, was a Basket Maker III piece and several Pueblo II sherds. The Pueblo II is a form which dates *circa* 850 in the Anasazi nuclei and 900 in the periphery. Since the fragments postdate the abandonment of the Mogollon village houses, as shown by their being in the fill, their presence can have little significance as far as correlation of periods is concerned. By 900, in the main Anasazi centers, Pueblo II was in vogue. The Basket Maker III piece on the floor of a house of still later date contributes even less. There is a closer connection between the Pueblo II sherds and the Three Circle, but even there a lag of approximately two generations is indicated. Consequently, no great significance can be placed on the occurrences. Without the dates, however, what would appear to be logical conclusions would present an entirely false picture of the relationship.

The status between the Mogollon and the Hohokam is not as clearly indicated. Georgetown potsherds were found in Pioneer levels at Snaketown,[21] and the painted sherds of the Georgetown phase are so similar

[20] Haury, 1936a, p. 116.

[21] Haury, 1936a, p. 118.

to the earliest painted pottery of the Pioneer that a definite relationship is suggested. In the Mimbres phase there is marked Hohokam influence. Reports do not state the stage of the Hohokam represented, but from other evidence it would seem to be the Sedentary. Hence a rough approximation of Georgetown and Pioneer, San Francisco and Colonial, Three Circle and Colonial-Sedentary, and Mimbres with Sedentary-Classic would not be entirely out of order. The Animas, of course, was coeval with the Classic.

The main features about the Mogollon are that it was a sedentary, agricultural-hunting complex, the hunting feature being more pronounced than in either the Hohokam or the Anasazi; it had rounded pit-houses followed by rectangular pit-houses that persisted into the 10th century, followed by pueblo type dwellings which were clearly an introduced trait; the atlatl and bow and arrow were used for weapons; pottery was made by the coiling process with the scraper and polishing stone as finishing implements; the dead were buried as a rule but there was some cremation; the pattern was peripheral to the Anasazi, the Hohokam, and some eastern form as yet unidentified. In the beginning the people were a roundheaded group with low skull vault. They did not practice cranial deformation. Later a roundheaded group with high vault and deformed occiputs appeared in the area. As is to be expected in peripheral districts, there were local adaptations of borrowed elements, developments peculiar to the region, and some lag in the appearance of certain features. The problem is complicated, due to differential rates of diffusion, by the fact that traits contemporaneous in the pattern from which they came reached the periphery as separate chronological entities. There seems to have been a closer relationship between the cultural patterns of the Anasazi and the Mogollon than between the latter and the Hohokam. In the study of the Mogollon the systems of nomenclature and classification employed are the same as those described in the discussion of the Hohokam and Anasazi.

NOMADIC AND SEMI-NOMADIC GROUPS

Very little is known at the present time about this division of Southwestern archaeology. Practically no work has been done in remains which could be attributed to peoples with a cultural complex based on the hunt, or the hunt supplemented to a degree by food gathering and a little agriculture. Perhaps the best known representatives of the nomadic phase are the so-called Folsom peoples, although no actual human remains have been found. Other sites are coming to light, for example the Pinto Basin materials of the California deserts area de-

scribed in AMERICAN ANTIQUITY, Vol. 1, No. 4, and as work progresses there will no doubt be more. Such remains as have been found were located on the peripheries of the general Southwestern area, and as yet there is nothing to show any connection between them and the cultural patterns described in preceding pages.

The Folsom complex is characterized by an association between man-made objects and extinct species of animals, bison and mammoth in particular, and is considered as indicative of a greater antiquity than hitherto supposed for the American Indian. The typical implement is a fluted projectile point which has become known as the Folsom point. Fluted points are not restricted to this complex, however, and have a fairly wide distribution throughout the area from the eastern slopes of the Rocky Mountains to the Atlantic and from southern Canada to the Gulf of Mexico. Sporadic specimens have been reported from regions west of the Rockies, but the distribution is in the main to the east. What the significance of the examples from the eastern districts is, can not be stated at the present time. There is still no evidence for their possible age or place in the main archaeological picture. The vast majority are surface finds and where they occur in comparatively large numbers, as in Ohio, Tennessee, southern Virginia, and western New York, there is nothing to indicate their relationship to the cultural remains in those areas. The fact that they bear a striking similarity to those in the west does not necessarily make them of equal antiquity.

The chief sites of importance for the Folsom complex are at Folsom, New Mexico, the type site for the points, Clovis, New Mexico, and the Lindenmeier ranch north of Ft. Collins, Colorado. The most significant occurrence of a fluted point, a Folsomoid form, as far as other Southwestern patterns are concerned, was in a cave in the Guadalupe Mountains in southeastern New Mexico. That particular specimen was in a level containing musk ox bones and lay at some depth beneath a Basket Maker stratum, an indication that the big game hunters were in that part of the area prior to the Basket Maker occupancy. Most of the evidence for Folsom relationships points toward the Plains, however, and subsequent development of the pattern probably took place there rather than in the Southwest. More detailed information on the complex can be found in special reports on the subject.[22] The writer reviewed the development of the Folsom problem in a paper which gives information on one of the specific sites, as well as a bibliography on the subject.[23] Hence additional discussion is not essential at this time.

[22] Howard, 1935; Renaud, 1934.

[23] Roberts, 1935b.

Other patterns pertaining to an early occupancy have been reported from Texas, but what connection, if any, the Abilene and Edwards Plateau patterns[24] may have with the Southwest have not been indicated. The fundamental eastern basis for Mogollon affinities is derived from other sources. Therefore, consideration of these phases seems beyond the bounds of this paper.

On the western periphery of the Anasazi province, in eastern Nevada, traces of an early group were found in a cave in association with remains of the ground sloth and horse and camel bones. Little is known of the cultural pattern beyond the fact that the people were skilled chippers of stone implements; were workers in wood, feathers, and sinew; and used various colors to paint designs on their products. They used the atlatl and foreshafted javelin for weapons. It is not definitely known that they hunted the sloth but various bits of evidence suggest that such was the case. It is thought that they visited the cave only for hunting purposes, occasionally camping there over night. The upper levels yielded Basket Maker and Pueblo specimens, and even some Paiute. The age of the early hunting culture has been placed between that of Folsom and the Basket Makers.[25] Some of the traits suggest Basket Maker affinities, yet all the evidence is for a much older pattern. Whether or not it may be an early form of Basket Maker is an unanswered question. More examples are needed before a relationship can even be postulated. Additional evidences of early peoples have been found in other Nevada caves, as reported in AMERICAN ANTIQUITY Vol. 1, No. 2, p. 119, and further information on the subject may be forthcoming when the necessary investigations have been made.

Much later in the time scale are the semi-nomadic groups inhabiting various parts of the area at the present time. In the south are the Apache; in the central districts, the Navajo; and along the northern and western peripheries, the Shoshonean peoples. Very little attention has been paid to possible archaeological remains attributable to them. In the first place, the general cultural pattern of these groups is so preponderately perishable in nature that little would be left after a comparatively short lapse of time and, as a consequence, sites would be extremely hard to find. In the second place, because they occur in a region where the sedentary peoples have left such rich materials, few have been intrigued by a desire to study their earlier aspects. Some Apache materials have been obtained by investigators seeking older remains, and a few Navajo earth-lodge ruins have been dug by excava-

[24] Ray, 1930; Sayles, 1935.

[25] Harrington, 1933.

tors occupied with Anasazi sites dating from the period of the Pueblo Revolt, 1680–1696.[25] The existence of old Navajo sites has been noted in the Chaco Canyon district, but studies in them have not been reported. Along the western periphery in eastern Nevada are remains, both in the open and in caves, which have received some attention from the Southwest Museum and other California institutions. These have generally been considered as Southern Paiute sites, but it is possible that some of them may have been left by other groups.

SUMMARY AND COMMENT

The discussion in the preceding pages may be summarized as follows: around the peripheries of the Southwestern archaeological field, traces of an early hunting people have been found that indicate occupancy at a very early date as evidenced by the hunting and killing of animals long since extinct. Thus far no connection has been demonstrated between any of these groups and subsequent peoples in the region. The most extensive remains are those of a sedentary, agricultural, pottery-making people. Two major provinces, the Anasazi and Hohokam, have been noted, and on the outer fringes of both, in southwestern New Mexico, are remains designated the Mogollon which are thought to provide good evidence for another province. The unfolding of the patterns in both major divisions, as well as in the third tentative one, progressed through a series of stages that were broadly synchronous from the standpoint of time and were also coeval in the appearance of certain cultural traits. The basic differences in large measure seem to have been governed by environmental factors. One pattern developed in a desert locale; another, in a plateau country; the third, in a region where elements of both were present, although plateau conditions predominated.

It is not possible to consider many of the problems confronting workers in the Southwestern field in the space available for the present discussion. Various recent publications have presented numerous views on the subject, and those interested in delving deeper may turn to the writings of Kidder and Kroeber, the Medallion Papers, and the reports of the Museum of Northern Arizona.

A few comments on the question of relationship and influences between the Hohokam, Mogollon, and Anasazi are pertinent, not because this is necessarily the most outstanding problem, but because it is stimulating so much undue speculation. As the reader will recall from

[25] Kidder, 1920.

the brief description of each pattern, there is very meager evidence as yet upon which to base conclusions. Furthermore, the bulk of the evidence tends to be one-sided, since the majority of the cross finds come from outside the Anasazi area. Where trade pieces have occurred in Anasazi territory, it has been peripheral precincts that supplied the specimens. Hence allowances must be made for both time and cultural lags. The lack of dendrochronological dates in the Hohokam province is a big barrier to correlations either with the Mogollon or the Anasazi. The situation as far as the latter are concerned is much more satisfactory. There is a definite date, 900 in round numbers, from which to work. Also there are more cross finds although, as already pointed out, the discrepancy in dates between the place where they were found and that where they originated considerably lessens their significance for the earlier phases. The difficulty in correlation between the Hohokam and the other two is increased by an insistence on an antiquity that is not necessarily actual.

Before dendrochronological dates were available in the Anasazi province, long lapses of time were postulated for the development of the various stages. When the dates were announced it became apparent that this was not the case. The developments were rapid and the ensuing static interval was protracted. The fundamental error lay in the conception that because one stage was known to have lasted a long time, the others must have been as long or longer, and the developmental phases slow and tedious. This same idea persists with respect to the Hohokam and to a degree helps confuse the issue. The Anasazi province is not the only area where there is evidence for a tremendously accelerated upswing in a short span of years. The growth of stonework in Egypt, where the progression from the first laying of simple masonry walls as a lining for tombs to the erection of the great Pyramid of Cheops was encompassed within a century and a half, and the rise of Greek art, are Old World examples.[27] These suggest that postulations of great lapses of time are not necessary to explain Hohokam developments, particularly in an area where other cultural patterns did unfold rapidly. The extent and depth of refuse mounds is no criterion for age. Nor does the fact that one group seemed less prone to move about than another demonstrate that the more settled was necessarily the older, especially when it is considered that the one was in a region where suitable village sites were none too plentiful and the other occupied a district where innumerable locations were available; also, that the one

[27] Kroeber, 1923, p. 447.

enjoyed a peaceful life, while the other was continually harassed by other peoples.

There has been so much assumption and theorizing on so little evidence that it is difficult to determine just how the problem should be attacked. Conclusions have been reached from lines of reasoning that just as logically indicate the reverse, and what begins as a premise ends as an accepted belief. The situation has been further complicated by the fact that comparisons in most cases have been made between materials from the nuclei of one province and the periphery of another without due allowance for the unquestionable time lag. Because certain traits from one province are contemporaneous with a specific phase in a peripheral site of another province is no indication that they bear the same relation to that phase in a nuclear site. Actually they may be contemporaneous with a subsequent phase which was already in full swing in the nuclei at the time of the peripheral association. In considering pattern influences, it is essential that the earliest date known for the fully developed form of the particular trait should be the one to govern conclusions, not that of a peripheral site which may be 100 to 125 years later in actual time. On the other hand, where an element may be interpreted as representing either of two phases, the latest should be consistently used unless there is a preponderance of evidence to the contrary. There appears to have been too much selection in such matters, especially where one would fit a given theory better than the other.

There are a few definite things that stand out at the present time. There is a fairly good association between the Hohokam, Mogollon, and Anasazi in their earliest stages. Georgetown sherds were found in Pioneer deposits, and Georgetown is apparently correlative with late Basket Maker III, certainly with Pueblo I. This would indicate a broad contemporaneity for all three at an early stage. It is true that the association with the Pioneer is in one of the later phases of that stage, and that there is older Pioneer pottery at the site, but there was also a pottery which preceded the Mogollon form represented, and an older Basket Maker III type than that correlated with the Mogollon. In the light of present knowledge the situation is a standoff as far as age is concerned. Also, it is hard to disregard entirely the general principle that when two types of objects are found together in sites of one group, and only one of the types is found in another series of sites, those containing both are to be considered more recent. From information now available, early Mogollon and Anasazi are found in Hohokam sites, but

Hohokam is missing from both early Mogollon and Anasazi. This has some significance with respect to the antiquity question, and when the factor of time lag in distribution is included, the case against it is even stronger. Consequently, it would seem more in line with the existing evidence to regard the picture as an approximately synchronous three-line development with very little in the way of reciprocal influence, one on another, until later stages.

Efforts to derive the Anasazi pottery designs from the Hohokam are not convincing when it is remembered that the Basket Maker III ceramic decorations were taken from Basket Maker II and III baskets, and that Pueblo I pottery shows a development and elaboration of Basket Maker III painted decoration augmented by patterns taken from woven objects such as head bands and sandals. In addition, a definite progression from rectilinear to curvilinear designs can be shown in the Anasazi without recourse to outside sources. There is no doubt but that there were some reciprocal influences, but the evidence for them is not as great as recent reports would indicate.

The contention that the Hohokam were the earliest farmers and pottery makers in the Southwest, and that they were the source from which the Mogollon and Anasazi developments stemmed needs the support of much more tangible evidence than that so far produced. It is true that agriculture and a knowledge of pottery must have reached the Anasazi from the south through some intermediary, but if these came through the Hohokam it would seem that they would more closely parallel that pattern. Certainly the pottery does not, and the agricultural methods differed. Much more needs to be known about the Hohokam, and the proof of diffusion and influence more convincingly established before concluding that it was the cradle for Southwestern cultural origins.

In many respects it seems more logical to think that southern traits present in the area might have been transmitted to both the Hohokam and the Anasazi through an early basic Mogollon group. This idea would no doubt have received more consideration when it was first suggested had it not been for the persistent emphasis on the antiquity of the Hohokam. Here again, though, there is too little evidence to warrant conclusions. When as much work has been done in Hohokam and Mogollon sites as in the Anasazi remains, Southwestern archaeologists will be in a better position to synthesize the subject of relationships, influences, and derivations. Until more information is available, however, sweeping conclusions are unwarranted and apt to be misleading.

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BAKED-CLAY OBJECTS OF THE LOWER SACRAMENTO VALLEY, CALIFORNIA[28]

ROBERT HEIZER[29]

DATA FROM archaeological investigations in the habitation mounds of the lower Sacramento Valley by the Sacramento Junior College during the last three years have thrown much light on a very interesting and hitherto imperfectly known aboriginal trait of molding and baking small clay objects. Wissler[30] characterizes California as an area in which pottery was absent. Kroeber[31] subsequently notes that pottery-making occurred north of the Tehachapi Mountains. Gayton[32] describes pottery in detail for the Yokuts and Western Mono. Meredith[33] first specifically noted the occurrence of baked-clay objects in the northern San Joaquin Valley. Holmes,[34] Jones,[35] and Schenck[36] followed, the latter's being the most comprehensive study. Nordenskiold[37] was of the opinion that the Sacramento delta region offered a parallel of independent invention of a substitute for stone to the Amazon delta region.[38] Since both independent invention and diffusion have been postulated to account for the origin of this "near-pottery," it may be worth while to review the question in the light of recent data.

The area in which notable concentration of these baked-clay objects occurs is along both banks of the Sacramento River from Vernon, at the mouth of the Feather River south to Courtland, a distance of sixty miles, and the alluvial valley bottom extending east to the foothills, particularly along the Cosumnes River. This lower Sacramento region,

[28] The author is indebted to Mr. E. W. Gifford, Curator of the Museum of Anthropology, University of California, for criticism; to Dr. Philip Drucker of the Department of Anthropology for assistance with the manuscript; to Charles Bell of the Sacramento Junior College for the drawings; to Mr. and Mrs. Beverley A. Blackmer of Pyramid, Nevada, whose generous support of field work made possible the observation of some of the data contained herein; and especially to Mr. J. B. Lillard, President of the Sacramento Junior College.

[29] University of California, Berkeley, California.

[30] Wissler, 1922, p. 226.

[31] Kroeber, 1922, p. 276.

[32] Gayton, 1929, pp. 239–255.

[33] Meredith, 1900.

[34] Holmes, 1902, pp. 176–178.

[35] Jones, 1923, pp. 121–122.

[36] Schenck and Dawson, 1929, pp. 359–368, pls. 82–86.

[37] Nordenskiold, 1930, pp. 35–37.

[38] Nordenskiold, 1930, pp. 33–34.

as well as the adjoining one to the south (the Stockton-Lodi area of Schenck's study), is a well defined geographic province, a valley floor composed entirely of alluvial silts from which stone is absent. This lack of stone is a point which merits particular emphasis.

No less than 250 sites have been located in the lower Sacramento area by the Sacramento Junior College archaeological survey. The sites, located in relation to oak groves and watercourses, are mounds

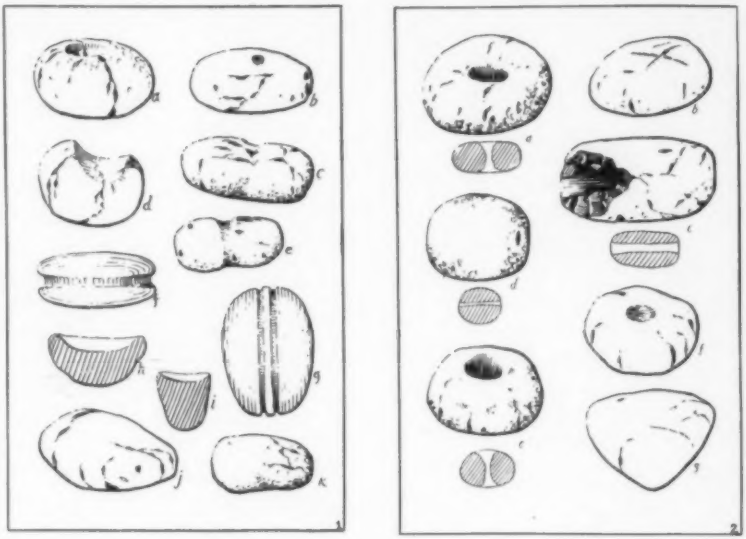

FIG. 1.—Baked clay artifacts of the lower Sacramento Valley region. 2/5 natural size.

formed by the gradual accumulation of camp refuse; mainly ash, dirt and organic material. Artifacts and burials are found throughout this deposit. Several key sites have been identified through excavation. The Johnson Site (Site 6 of Schenck) on the Cosumnes River, and the Vernon Site at the confluence of the Feather with the Sacramento River, may be classed as such. The reason for their being focal centers of culture is primarily a geographical one, involving the intersection of trade routes, contact points of different tribes, or more favorable possibilities of securing an adequate food supply.

The objects of baked clay found in the lower Sacramento region are of three main varieties: (1) "balls," (2) short, tubular pipes, (3) figurines or effigies of birds and animals. The clay balls vary considerably in form, and the following types may be distinguished.

Unspecialized type. (Figure 1: 1b, j, k; Figure 2: 4b, d, f)

Smoothed forms exclusively. Round, rounded-flat, elongate cylinders, or flattened cylinder forms predominate. By far the greatest number of specimens are of this

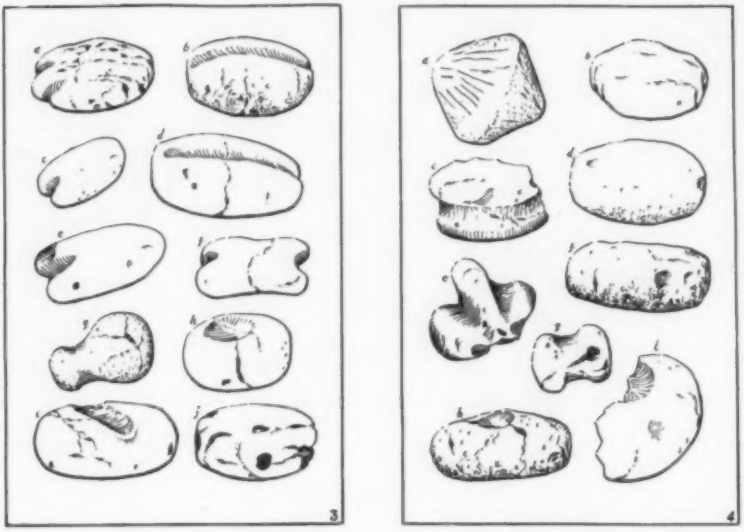

FIG. 2.—Baked clay artifacts of the lower Sacramento Valley region. 2/5 natural size.

type. Average length 70 mm., width 35–50 mm. The maximum size noted is from the Vernon Site and measures 153 mm. long and 105 mm. wide.

Spool-shape type. (Figure 2: 4g)

a. Smoothed. Cylindrical, concave sides. Concavity effected by hand-molding. Some specimens flattened. Average length 30–40 mm., diameter 25–30 mm.

b. Tule-impressed. Shows imprint of tule wrapping on surface. Average length 40 mm., diameter 25–30 mm. First wrapped longitudinally, then around center tightly, forming constricted equator and bulged termini.

Angular cylinder type.

Originally made as a smooth cylinder, these have been made into pentagonal or hexagonal shape by pressing plastic clay firmly on a flat piece of basketry. Without

exception, this angular-cylinder type shows basketry impressions. Average length, 80 mm., width 40 mm.

Cupped type. (Figure 1: 1a, 2f; Figure 2: 3h, 4h, i)

a. Cupped on one surface. Range in shape from flattened discs to true hemispherical forms. Cup has either been pressed in with the finger or punched in with a stick. Cup ranges in depth from 3 mm. (Figure 1: 2f) to 6 mm. (Figure 2: 4i). A minor variation of this type is shown in Figure 1h, i. These resemble miniature paint mortars. Depth of the cup in these sometimes up to 12 mm.

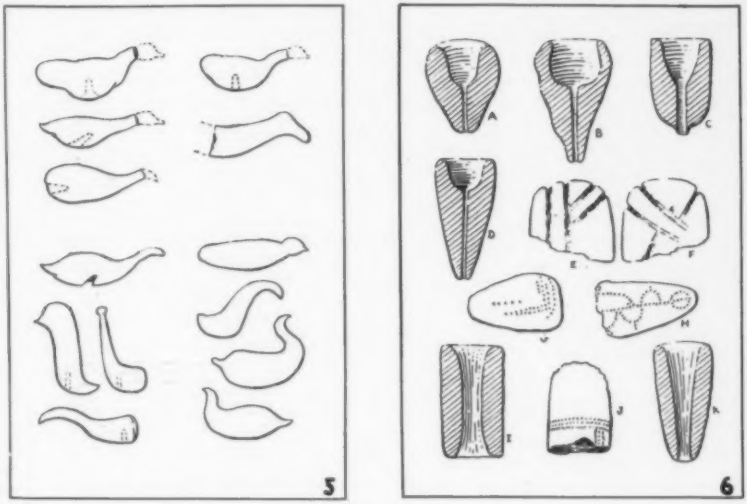

FIG. 3.—Baked-clay effigies or figurines, tubular pipes, and decorated "ball" forms. 2/5 natural size.

b. Cupped on both surfaces. Objects average 60 mm. diameter and 30 mm. thick. Same technology as Cupped type *a*.

Cone type. (Figure 1: 1h, i; Figure 2: 4a)

a. Double cone. Maximum diameter at center with rounded ends.

b. Cones. Occasionally these specimens have a concave, pitted surface. They resemble Figure 1: 1i.

Perforated types. (Figure 1: 2a, c, d, e)

a. Doughnut type. (Figure 1: 2a, e) Flat disc shape. Average diameter 70 mm., thickness 3.5 mm., hole diameter 15 mm. All quite uniform in size indicating stabilized type for definite use. Hole occasionally polished from (?) use.

b. Perforated hemisphere. (Figure 1: 2c) Problematical usage. Perforation made by molding around a stick. Holes not smoothed from usage. Diameter, ca. 50 mm.

Triangular type. (Figure 1: 2g)
Smoothed, with concave sides and three rounded points. Is a minor variant of the unspecialized type, and is quite common.

Grooved types. (Figure 1: 1c, d, e, f, g; Figure 2: 3a, b, c, d, e, f, i; 4c, e, g)
Outside the unspecialized type, this is the most numerous and shows more variation in forms. Grooves were formed by cord-binding, pressing in with the fingers, pressing the wet clay lightly with a stick, or by scratching with some sharp pointed object.

a. Longitudinal surface groove. (Figure 1: 1c, d; Figure 2: 3i) These are the smooth, unspecialized type enhanced with the addition of a pressed groove (Figure 1d), or a rubbed-in groove (Figure 1: 1b). Possibly its use was for straightening cane joints for arrowshafts, etc. A variant is seen in the specimens where the groove is on both surfaces instead of only one. Figure 1: 1c, d and Figure 2: 3i show still another variant where a transverse surface groove is found. Figure 1: 1d illustrates a specimen where the groove is nicely polished from use.

b. Grooved over one end. (Figure 2: 3c, e) The groove here is coarse as if pressed with the finger. The object approximates a heart shape, and the groove shows no sign of usage. Figure 2: 3a, 4e illustrate an elaborated variant form of *b*, with two grooves over one end. Specimens with three grooves over one end are found, but are quite rare.

c. Grooved over both ends. (Figure 2: 3f) The center is constricted and there are deep notches in each end. Could be used as a sinker, sling stone or bolas-stone.

d. Incised surface grooves. (Figure 3: 6e, f) Evidently a sharp pointed implement was used to incise these clean-cut grooves.

e. *Lateral circumference groove.* (Figure 1: 1f; Figure 2: 4c) This is a molded groove, executed either with the fingers or by pressing a stick in the wet clay. These are rather large and average ca. 80 mm. in diameter. Figure 1g shows a variant of this, the longitudinal circumference groove being formed by a thick grass cord, or small stick. Still another type of circumference groove is noted. This type is rather uncommon, the specimens are always small in size, and the groove was cut clear around the piece.

f. Cord-impressed groove. This type is always small, and may have been utilized in many ways, such as sinkers, bolas-stones, etc. The cord imprints are easily recognizable inside the groove.

Baked-clay artifacts have been noted from every principal site in the lower Sacramento area. In those sites where stone is prevalent in the deposits, or is found in the environs, only isolated and rare findings of baked-clay objects have been noted, and these are probably of extraneous origin. The common "ball" type of object in one form or another is locally widespread. The pipes have a more limited distribution, and the effigies or figurines failed to spread far from the local center, Site 6. We can summarize the normal range of the baked-clay artifacts as limited to the stoneless overflow and delta region of the lower Sacramento and northern San Joaquin rivers in the bottom-land alluvial sections. Outside these limits, baked-clay objects are typically absent. Naturally, as could be expected, the northern boundary is less sharply

defined, for it was along the valley floor that trade contact and concomitant cultural transference would be most facile and likely.

Site 6 (Schenck and Dawson's terminology), or the Johnson Site, appears to have been the local focus of this remarkable baked-clay complex. Significantly, this site displays a very wide variety of cultural remains, and seems to be a distributional center to types. A rather typical example of zoned distribution is seen here. Site 6 yields in great quantities all known baked-clay types, including such unique forms as pipes and figurines (or effigies). Nearby sites disclose no figurines, an occasional pipe, and a lesser number of "ball" types. The farther one proceeds from this key site, the fewer grow the number of types in individual sites. When sites about fifteen miles north of the Vernon Site are reached,[39] examples are noted but rarely. Data are incomplete on the distribution to the south of our area. Schenck's work is all we have to judge from, and the indications are that this trait may extend well down into the San Joaquin Valley.

Relative temporal placement of this trait can be derived from stratigraphy, the baked-clay artifacts occurring at varying depths within one culture layer. The recent work of the Sacramento Junior College has brought to light two successive prehistoric cultures of the lower Sacramento Valley area.[40] Essentially their results demonstrate the existence of two mutually distinctive cultural horizons, the so-called Early and the Late, the latter extending into the Recent or post-contact period. The Late culture, which forms the great bulk of the deposits, though distinct from the Early as regards stratigraphy, skeletal type and material culture, proves to be an elaboration in part (i.e., overlay) built on the foundation of the basic Early pattern. This elaboration comprises a long list of cultural traits which entered the valley at a relatively late date, some of northern derivation, the majority probably of ultimate southern provenience. Among these intrusive elements may be included that of hand-molding and baking clay objects. It is very important to note that only in the Late horizon do baked-clay objects occur. It is not definitely known whether they are present in the post-contact horizon, but in all probability they are. Presumably as metal containers replaced baskets for cooking in protohistoric, and early historic times, the manufacture of the baked clay artifacts was discarded.

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[39] W. R. Wedel's excavations at the Howells Point Site for the University of California, 1935. Writer's excavations at the Miller Site, two miles north, 1936.

[40] Lillard and Purves, 1936. Kroeber, 1936.

Baked-clay artifacts with one recently noted exception, are not associated with burials, and it is possible that they were considered of no actual value and so were not buried as grave offerings, though unique forms such as pipes, figurines, and decorated forms evidencing the stamp of individuality speak against such an hypothesis. A surface concentration is noted on most sites, probably due to plowing and exposure. The most definite concentration of these clay "balls" of the larger types is in the ash deposits and fireplaces (not necessarily associated with house floors) and in refuse deposits, rather than in any other parts of the sites, and indicates that they probably had a utilitarian use and may have been connected with cooking. With this exception, these baked-clay objects occur randomly and without specific association throughout the Late horizon. Several fragments of crude, thick, undecorated, untempered, rimless "vessels," made by digging a deep hollow in a lump of clay leaving a thick wall, have been found in Site 6. They are fundamentally cupped balls, a variation which may have been derived from that type which resembles a small paint mortar.

Common river-bottom clay ubiquitous in the delta and overflow region was utilized for the manufacture of these objects. In most cases, instead of the gritless clay (gray adobe), the reddish subsoil which has a quite heavy sand content was used. The majority of specimens were hand-molded. The method of manufacture was, in most cases, shaping by the fingers. Molding by a form is improbable because of the unevenness of the surfaces, diversity of form, general size, and extreme range of variation within any one type. The type which shows basketry impressions was roughly molded in the hands, pressed firmly against a flat piece of basketry, and then fired, the evident intention being to preserve the pentagonal shape and basketry imprint. The following types of basketry can be identified from these clay impressions: (1) medium-fine coiling, and (2) open-work twining, with wicker probably but not surely represented. Still another type shows impressions, though of a different order. In this case the form is a variant of the typical spool shape. Tule (*Scirpus lacustris*), or occasionally small grass, was first wrapped around longitudinally; then a second binding was placed tightly around the circumference of the cylinder at the middle, thus forming a gentle concavity and producing the spool shape. Interestingly enough, the smoothed clay objects (i.e., all except the tule- or grass-impressed specimens) are almost invariably of higher grit content. The latter may be evidence of an unintentional alternative to adding tempering material. Where raw clay with a high sand content (functioning

naturally as a temper material) was available, the object could be molded, dried and fired without fear of breaking. Gritless clay, however, checks badly upon drying, unless the rate of evaporation be retarded. This retardation could be effected by wrapping with some material which would permit only slow evaporation of the water in the unfired object. In some such manner, through the process of trial and error coupled with observation, the native workers in clay must have learned and practiced the effects of tempering. The writer is inclined to believe that possibly (if indeed this is a locally discovered concept)[41] the discovery of the effect rather than the principle or process of tempering was made, for among the 2500 specimens studied, there were no certain cases of intentional adding of sand to gritless adobe clay. The spool was fired still enveloped in the tule wrapping, for carbonized tule is sometimes found in the surface imprint cracks. Grooves were made, as in the last case, by vegetal binding, pressing with the fingers, digging out with a sharp stick, or pressing a cord into the wet clay, leaving a clean-cut channel, and firing. There is no evidence of the coiling technique of building up the clay. Figurines and pipes were molded in the hands and then fired. Intentional decoration (Figure 3: 6g, h) was made by punching holes in the wet clay and firing it. These punctate holes are very small and are *ca.* 1 mm. apart, generally in two or three parallel lines in angular or curvilinear designs. In hardness these baked-clay artifacts range from 2 to 6 (Moh); in texture, from fine to medium coarse; in structure, amorphous, compact, and not porous or flaky; in color, from dull gray to terra-cotta, although in many cases the surface is blackened by firing.

The occurrence of the baked-clay "balls" in an area where "stone-boiling" was an important culinary technique, but where stone was wholly absent, suggests a reason for the substitution of clay or stone as "cooking-stones." Indeed, their further occurrence in ash lenses and firepits, evidences of fire-blackening and their fragmentary condition in at least half the cases, possibly due to continued reheatings, argue for this also. Holmes suggested their use as sling stones. The Pomo, though not a valley people, make baked-clay balls and use them as sling-stones. One burial from Site 6 with a hole in the temporal bone of the skull and a small, smooth, spool-shaped clay object in the brain cavity offers the only bit of evidence which we have relative to such a use. The sling for war is known only among the Western Mono

[41] See footnote 45.

and Trinity River Wintun (neither of whom are known to have these baked-clay objects), and ethnological information indicates that the sling was used for hunting waterfowl in the central valley. A number of grooved types are adapted to use as sinkers and net weights. Confirmatory evidence is observed in the bottoms of dessicated lakes and sloughs along the Sacramento river-bottom country where these grooved clay objects can be picked up on the surface. The great number and diversity of types argue against the "cooking-stone" hypothesis as the only purpose. Possibly the manufacture of primarily utilitarian objects of fictile material with such an easy path open to individual initiative in making other forms, such as effigies or figurines and decorated forms, explains the reason for the variety of types and shapes. Imitative forms, fashioned after stone counterparts such as the pipe, "doughnut" (discoidal or spindle-whorl shape), and "charmstones," are quite evident.

Site 6 is the center for tubular clay pipes, eleven out of the fifteen on record coming from this mound. Many small baked-clay effigies evidently represent birds, probably waterfowl. Occasional animal forms, such as possible representations of the coyote, are found. Either their conventionalization or crudity obscures the intended identity of other forms. No figurines representing human forms have been noted. Outside of three isolated examples, all the five or six hundred effigies collected are from Site 6; a notable concentration. Why such a distinctive form did not spread as did the other types is hard to explain; possibly the effigy form was developed on the spot, and lack of outside interest in further adoption explains its restricted occurrence. This, however, is improbable, since this form, from stratigraphic evidence, is as old as any in the site. The same might be said of the local developments of labrets and beads in the Stockton-Lodi region.

In brief, in the light of present evidence, we note the practice of baking small clay objects limited to the alluvial delta and overflow region of the lower Sacramento Valley.[42] These baked-clay artifacts are found only in the Late level of the earth mounds of this area, and comprise a large number of relatively uniform and widespread types, all of which perhaps ultimately derive from the basic undifferentiated "ball" form which was first made as a substitute for stones (entirely lacking in this lowland region) for stone-boiling. Site 6, on the Cosumnes

[42] The distribution of baked-clay artifacts south of the lower Sacramento region is very imperfectly known, but in all probability it extends for some distance south along the San Joaquin Valley floor.

River, probably by reason of its geographical position, forms the focus of this specialization in clay work, all "ball" types, and in addition such unique forms as pipes, effigies, and crude pots, occurring there.

It remains now the examine the problem of the source, internal or external, of this complex of baking clay. In the Stockton-Lodi region similar baked-clay artifacts are found archaeologically. Ethnographic accounts attribute the manufacture of these artifacts to the territory of the Plains Miwok and Chulamni Yokuts of the Stockton plains. Some distance southward (*ca.* 150 miles), at Kings River, we encounter the first of a series of true pottery-making groups, the foothill divisions of Yokuts. These people, like their Western Mono neighbors, made a crude, thick, undecorated ware by the pressing or coiling process. Rude though it was, this ware can be classed unquestionably as true pottery which, as Gayton and Kroeber[43] have brought out, was probably derived from the Southwest.[44]

The critical point then becomes the relationship between the baked-clay artifacts and the nearest true pottery. Independent development might be proposed for the former on the basis of its apparent distinctness in form, possible lack of tempering, and other peculiarities. However, several facts are oppositional to this assumption of parallelism. To date, all our archaeological data point to the introduction of this art of molding and baking clay artifacts in a fully developed stage into the lower Sacramento Valley. No incipient forms have been found in the Early culture of the lower levels, nor is there a sequence from simple to complex types. Rather, the numerous elaborate types appear in the sites of the valley floor simultaneously with many other distinctive features which set off the Late from the Early culture. The appearance of a new physical type associated with the distinctive cultural components indicates rather strongly the actual intrusion of an alien population. It would seem that the new people of the Late horizon brought with them the baked-clay complex.

[43] Gayton, 1929, p. 250. Kroeber, 1928, p. 382.

[44] New data have appeared which bear out Gayton's conclusion. Work by Steward, Harrington, and others has revealed the extension of Southwest pottery well into northwestern Utah and southeastern Nevada (Steward, 1933; Harrington, 1928), which suggests (see map) a continuous distribution linking south-central California ultimately with the Southwest. There appears to be no direct connection between the Yokuts-Mono pottery and that found south of the Tehachapi Mountains. The southern California ceramics seem more closely related to the Yuman-Piman (and archaeologically, Hohokam) paddle-and-anvil complex as Gifford (1928, p. 372), Gladwin (1930), and Rogers (1936, p. 2) have indicated. The wider aspects of the pottery distribution shown in the map will be discussed in a separate paper.

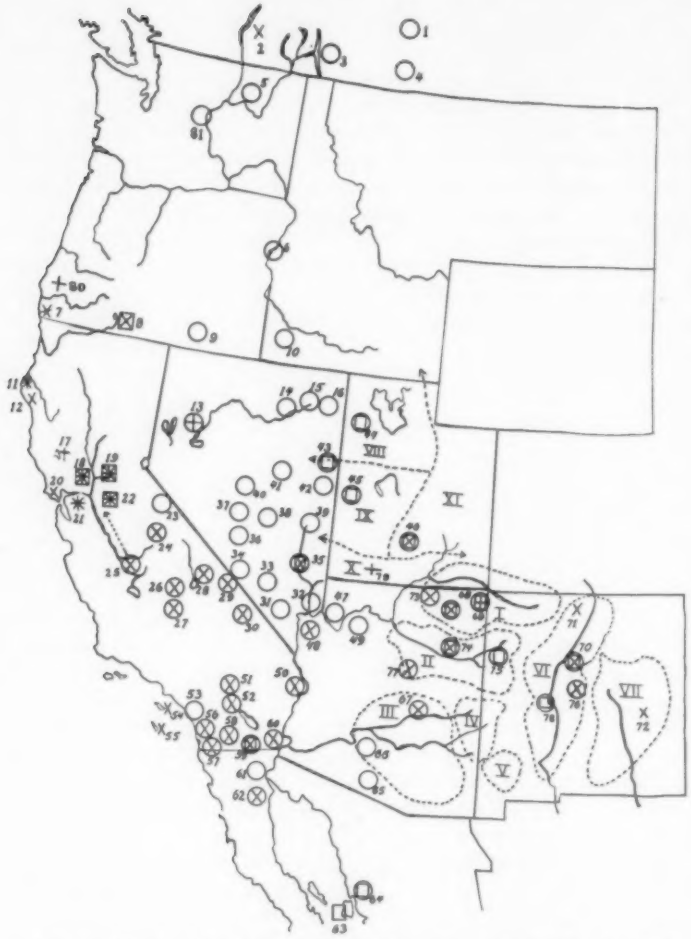

FIG. 4.—Distribution of the Practice of Molding and Baking Clay Artifacts

□—Figurines (clay dolls, animal or bird effigies).

×—Tubular clay pipe.

○—True pottery vessels.

+—Baked-clay objects (balls, etc.)

Starred numbers indicate archaeological occurrence.

Areas I–VII, After Kidder, 1924, fig. 5; areas VIII–XI, After Steward, 1933, fig. 1. (Plain pottery and clay figurines generally distributed in the Northern Periphery. Steward, 1933.)

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2. Okanagan, Teit, 1930, p. 278.
3. Kutenai, Ray, 1932a, footnote pp. 40–41.
4. Blackfoot, Wissler, 1910, p. 26.
5. Sanpoil, Ray, 1932, p. 39 (sun-dried pottery); Ray, 1932a, p. 129.
6. Snake, Ross, 1855, p. 273; Lowie, 1909, p. 177; Lewis and Clark III, p. 19.
7. Chetco River, Schumacher, 1874, p. 357.
8. Klamath, Spier, 1930, pp. 86–87.
9. Catlow Valley, Cressman, 1936, pp. 36–37.
10. Owyhee County, Schellbach, 1930, p. 123.
11. Wiyot, Loud, 1918, pp. 377–380, pl. 20.
12. Mattole, Driver, Unpublished element lists.
13. Paviotso, Loud and Harrington, 1929, p. 109, pl. 53; Leonard, 1904, p. 167.
14. Humboldt River, information from Mack Gordon, field-geologist.
15. West of Wells, Harrington, 1928.
16. Cobre, *ibid.*
17. Pomo, Loeb, 1926, pp. 183–4; Loud, 1918, p. 379 (sun-dried clay dolls).
18. Wintun (Patwin), Sacramento Junior College unpublished archaeological field notes.
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20. Sausalito Shellmound, Specimen, Univ. Calif. Museum #1-14798.
21. Costanoan, Orinda Mound, Specimen, Univ. Calif. Museum, #1-26622.
    Emeryville Shellmound, Schenck, 1929, p. 225, pl. 54.
22. Miwok (and N. Yokuts) Schenck, 1929, pp. 359–368, pls. 82–86.
23. Eastern Mono, Gayton, 1929, p. 250.
24. Western Mono, Gayton, 1929; Steward, 1933a, p. 219.
25. Yokuts, Gayton, 1929; Kroeber, 1925, p. 537.
26. Tübatulabal, Kroeber, 1925, p. 608; Driver, Unpublished element lists.
27. Kawaiisu, Driver, Unpublished element lists.
28. Owens Valley Paiute, Steward, 1933a, p. 269, 319.
29. Panamint, Driver, Unpublished element lists.
30. Death Valley, Steward, 1933a, pp. 268–69, 319.
31. Near Las Vegas, Harrington, 1926, pp. 69–73.
32. Virgin River, Harrington, 1926, pp. 69–73.
33. Indian Springs, Harrington, 1926, pp. 69–73.
34. Hot Spring-Beatty-Carrara region, Harrington, 1928, pp. 238–39.
35. Muddy River, Harrington, 1926, pp. 69–73; Hayden, 1930, p. 81.
36. Wellington, Harrington, 1928, p. 238.
37. Five Mile Station, Harrington, 1928, p. 238.
38. White Rock Canyon, Harrington, 1928, p. 237.
39. Near Pioche, Harrington, 1926, pp. 69–73.
40. Hot Creek-Keystone, Harrington, 1928, p. 238.
41. North of Ely, Harrington, 1928, p. 238.
42. Baker, Harrington, 1926, pp. 69–73; Wheeler, 1936, p. 208.
43. Bishop Ranch (Puebloan sherds and corncobs), Harrington, 1926, pp. 69–73.
44. Area VIII (Great Salt Lake Area), Steward, 1933, p. 18.
45. Area IX (Western Utah Area), Steward, 1933, pp. 18–19.
46. Area XI (Upper Colorado Plateau) Fremont River, Morss, 1931, pp. 46–54.
    pls. 25–29 (Unbaked, sand-tempered clay [p. 5] associated with fired pottery); Steward, 1933, pp. 6, 8–9, 17–18.
47. Area X (Lower Colorado Plateau), Shivwits, Lowie, 1924, pp. 225–226.
48. Walapai, Rogers, 1936, p. 40.
49. Havasupai, Rogers, 1936, pp. 39–40.
50. Mohave, Rogers, 1936, pp. 36–37; Klimek, 1935, Table 4.
51. Serrano, Kroeber, 1925, p. 619; Klimek, 1935, Table 4.
52. Cahuilla, Rogers, 1936, pp. 22–23, 27–28, 29.
53. Juaneno, Kroeber, 1925, p. 269.
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58. Southern Diegueno, Rogers, 1936, pp. 18–20.
59. Kamia, Rogers, 1936, pp. 25–26.
60. Yuma, Rogers, 1936, pp. 30–35; Forde, 1931, pp. 123–24, 117.
61. Cocopa, Rogers, 1936, pp. 35–36.
62. Kiliwa, Rogers, 1936, pp. 17, 42.
63. Seri (Tiburon Island), Saville, 1924, pp. 223–225.
64. Seri (Mainland), McGee, 1898, p. 185.
65. Papago, Gladwins, 1930, p. 178; Gladwin, 1929, p. 121.
66. Pima, Gladwins, 1930, p. 178; Gladwin, 1929, p. 121.
67. Southeastern Yavapai, Gifford, 1932, pp. 213–14.
68. Area I (San Juan Area) Northeastern Arizona, Guernsey, 1931, pp. 86–88, 111, pls. 31, 51; Kidder and Guernsey, 1919, pp. 143–44, figs. 62, 63; Hough, 1901, p. 342, 316–17, pl. 96.
69. San Juan Area, Morris, 1927, pp. 151–58, figs. 8–12.
70. San Ildefonso, Gifford, Unpublished element lists.
71. Jicarilla Apache, *ibid.*
72. Area VII (Eastern Peripheral Area), *ibid.*
73. Navajo, *ibid.*; Sapir, 1930, pp. 575–76.
74. Area II (Little Colorado Area), Walpi, Gifford, Unpublished element lists.
75. Zuñi, *ibid.*
76. Area VI (Rio Grande Area), Pecos, Kidder, 1932, pp. 112–133.
77. San Francisco Mountains; Bartlett, 1934, pp. 58–59, fig. 42.
78. Luna, Hough, 1914, pp. 111, 115, 117, figs. 260–277.
79. Southern Paiute, Moore, 1913, fig. 32 p. 72.
80. Rogue River, Pfeiffer, 1856, p. 318.
81. Middle Columbia Salish, Teit, 1928, p. 125.

In view of these facts, a change in form (assuming that, for example, figurines wherever found, even though they assume human, animal or bird shapes, are still generically figurines, and probably are ultimately historically related) seems to be less significant. After all, form is but one of the many elements involved in the process of transforming clay into human artifacts. Use determines form to some extent, and perhaps the presence of an already developed technique of stone-boiling in baskets in the Central Valley would militate against the substitution of pottery vessels, the pottery form being adopted which would apply specifically to basket cooking—in this case, baked-clay balls. Mixing, tempering,[45] molding, drying, and firing seem more fundamental to the making of pottery than the form assumed by the object. In any case, correspondences of certain forms were noted between the Southwest and lower Sacramento areas.[46] The map indicates a rough correlation, despite incomplete data,[47] of the making of the pots and pipes, and to a lesser extent of figurines. Both pipes and figurines appear along with the baked-clay artifacts of the lower Sacramento Valley.

To sum up, not only was clay baked in the Southwest and lower Sacramento Valley, but the intervening distribution of specific types approached continuity; the Sacramento Valley complex was of alien

[45] The question here is: Are we to consider that the presence of the principle or concept of tempering by the recognition of the various reactions of different natural clays demanding different treatments in the baked-clay artifacts of the lower Sacramento Valley is an indication of ultimate historical connection with Southwest pottery (see Valliant, 1932, pp. 1–2; cf. Criterion 1); or are we to be strictly subjective in interpreting the question of tempering as either definitely adding or not adding tempering material? The writer is inclined to accept, in this case, the former interpretation.

[46] It is interesting to note that baked-clay objects similar to those of the lower Sacramento Valley (Figure 2: 4a; Figure 3: 5) were found at Pecos in the Glaze V period, dated *ca.* 1550–1650 (Kidder, 1932, pp. 141–42, Figures 121, 123, 126). In addition, the Pecos bird figurines or effigies of Glaze V are identical in many respects to those of our Californian area (cf. also Hough, 1914, pp. 115–117). At the other end of the time scale, we note an apparent similarity between the "nipple-shaped" objects of the Basket Maker horizon in the San Juan area (Morris, 1927, pp. 151–158, Figures 8–12) in both form and punctate designs to certain baked clay artifacts of the lower Sacramento Valley region (cf. Figure 3: 6g, h).

[47] E.g., Nevada, where little archaeology has been done, and the data are based for the most part on superficial observations of survey parties. It may be significant to note that wherever intensive archaeological investigations have been made (e.g., Mesa House, Lower Sacramento Valley region, Northern Peripheral area of Utah, the Southwest), our distributions and number of types on record are much fuller. We may expect that with more research will come a resultant filling in of the gaps in the distribution as exhibited by the map.

introduction, and there were relationships of certain forms (bird effigies, clay pipes, baked-clay balls), and techniques (tempering [?], punctate designs) in the two areas,[48] all indicating a genetic connection between Southwestern and lower Sacramento Valley pottery.

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[48] In plotting the distribution shown in Figure 4, the main objective has been to define the limits and essential distribution of the various types of objects under consideration here. In this sense I may appear to have exercised a subjective choice, since each specific occurrence could not be plotted individually, and since all do not carry equal weight. If, however, the map be primarily considered as showing presences within given areas, the eclectic element is of secondary importance.

Since submitting this article for publication, our party of 5 has been doing archaeological reconnaissance in eastern Nevada, and has there established the fact that pottery is of general distribution as far west as Battle Mountain on the Humboldt River and to the north connecting with the Snake River occurrences in southern Idaho. Dr. Julian H. Steward's forthcoming paper, *Ancient Caves of the Great Salt Lake Region* (B.A.E., Bull. 116) contains much information pertinent to this whole question, especially in regard to the Great Basin Shoshone.

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A SPEAR THROWER FROM OKLAHOMA

W. E. BAKER[49] AND A. V. KIDDER[50]

THERE IS REASON to believe that the bow came into use in the New World in relatively recent times, and that prior to its introduction, or its much less probable local invention, the spear-thrower enjoyed continent-wide distribution in both Americas. These suppositions are based on the apparent total absence from all respectably ancient deposits of small, light points suitable for the tipping of arrows; and, conversely, by the presence in such deposits of larger points, of sizes and weights appropriate for service with the heavier, longer darts propelled by the spear-thrower. Furthermore, the spear-thrower is known to have been replaced by the bow in the Southwest during the Basket Maker II period, probably in the early centuries of the Christian era. Lastly, the widespread but very spotty modern distribution of the spear-thrower gives the impression that it is, so to speak, a relic-trait; while the few ancient specimens which have come to light indicate a much more extensive prehistoric range.

Because of paucity of data, due to the perishable nature of the implement concerned, and because the chronological relationship of spear-thrower and bow bears directly upon highly important problems of culture diffusion between the Old and New Worlds, it is desirable that all pertinent material be made available for study. It therefore seems worth while to record a fragmentary spear-thrower found by the senior author in a cave on Cimarron River, northwestern Cimarron County, twenty-five miles west and nine miles north of Boise City, Oklahoma.[51]

The original limited digging by the senior author yielded, in addition to the specimens here illustrated (Figures 5–6), ears and cobs of maize, pumpkin seeds, yucca sandals, fire-drill hearths, beads of bone and chinaberry seeds, a child's mummy, and two skeletons, with one of

[49] Boise City, Oklahoma.

[50] Carnegie Institution, Washington, D. C.

[51] The cave was discovered by the senior author's son, Ele, in 1928. It was later investigated by E. B. Renaud of the University of Denver, who published a brief description of his work in it and in other nearby caves (Colorado Scientific Society Proceedings, Vol. 12, No. 5, pp. 123–135). Subsequent excavations were made by the Oklahoma Historical Society, and the cave was finally cleared in the summer of 1934 for the University of Oklahoma by Ele Baker. Nothing, apparently, has been published subsequent to the Renaud paper.

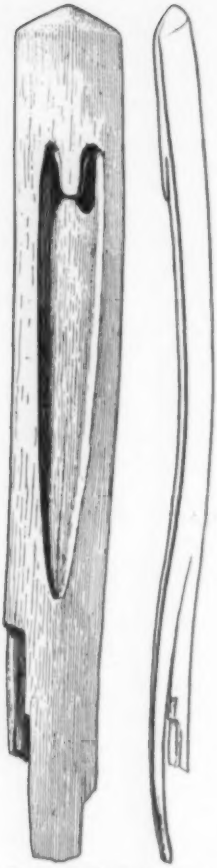

FIG. 5.—Cimarron Cave spear-thrower (11/12).

which was a piece of fur-cloth. Ele Baker recovered part of a twined-woven bag. Renaud mentions coiled basketry and cakes of acorn meal. The nature of the above objects, together with absence of pottery and feather-cloth, indicates a culture, closely analogous to that of San Juan Basket Maker II. It differs from the latter in the crudity of its sandals. It is much less closely allied to, and seemingly older than, the culture of the Ozark Bluff Dwellers, in which the spear-thrower is also found.[52]

The drawings bring out all significant points of the Cimarron Cave spear-thrower. It conforms exactly to the San Juan type in that it ends in an obtuse angle; and in that the spur, being sunk in a groove, does not protrude above the surface, as it does in examples from caves in the vicinity of El Paso, Texas. The missing shaft doubtless bore leather finger loops similar to those from the San Juan and the El Paso district.[53] So flat a shaft could hardly have been provided with a cross-pin of the sort which formed the grip of Harrington's Ozark specimen and those of Aztec origin from Mexico City.[54]

FIG. 6.—Slotted foreshaft (1/1).

The slotted object (Figure 6) is a foreshaft lacking its stone point. It serves to prove that the Cimarron darts, like those of the San Juan, were compound.

[52] Harrington, M. R., Amer. Anthrop., n.s., Vol. 26, No. 1.

[53] For San Juan spear-throwers see: Kidder and Guernsey, Bur. Amer. Ethnol. Bull. 65, pl. 82; Guernsey and Kidder, Peabody Mus. Papers, Vol. VIII, No. 2, pl. 33; Guernsey, same series, Vol. XII, No. 1, pl. 50. The El Paso specimens are in the Peabody Museum of Harvard. They will shortly be published by Mr. and Mrs. C. B. Cosgrove.

[54] Harrington, *loc. cit.*; Gamio, Ethnos., Vol. I, 1921, lam. 13, b.

THE WIKIUP DAMSITE NO. I KNIVES[55]

L. S. CRESSMAN[56]

MR. JOHN F. ISACKSON, while working for the United States Bureau of Reclamation, September 13, 1934, discovered two Indian knives or side scrapers.[57] The Bureau of Reclamation was engaged in making a survey of the quality of the soil at this point to hold water for a storage reservoir to impound the waters of the Deschutes River. The project was known as the Wikiup Damsite No. I, Deschutes Project. The site is located in Sec. 8, R. 9E. T. 22S., Willamette Meridian. It is shown on the Maiden Peak quadrangle of the U. S. Geological Survey of Oregon. Plate I, Figure 1 shows the location of the test pits, drill holes, and trenches. The logs of these are shown in Appendix B. Pit 4 is just to the east of the concrete monument on Control Line Damsite No. I at 14, 47.8.

Since it was the duty of these workmen to record the character of the soil strata through which they dug, they were careful to be on guard for any unusual objects or conditions which might appear. Mr. Isackson told the writer on September 15, two days after the discovery of the knives, that he saw them on the shovel as he lifted it full of dirt from the side of the pit. He recovered the knives, made a note of where they had been dug out (he knew where that shovel full of earth had come from, although he had not seen the knives before lifting them with the soil in which they lay) and turned them over to the engineer on the project. Mr. C. A. Fisher. Saturday, September 14, Mr. Phil Brogan of the *Bend Bulletin*, who realized the possible significance of the dis-

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[55] A report on the examination of the Test Pit No. 4 site, Wikiup Damsite, Deschutes Project, Oregon.

EDITOR'S NOTE: Illustrations of the forest cover and of the roots mentioned on pp. 58–59 were submitted by the author, but were withheld from publication for financial reasons.

[56] Professor of Anthropology, University of Oregon, Eugene.

[57] See affidavit executed by Mr. Isackson (Appendix A). Mr. Isackson turned two knives over to the Oregon State Museum of Anthropology, but in conversation with the writer explained that he saw parts of a third. These parts he was unable to recover from the dirt thrown out of the test pit. The reference to three knives in the affidavit is thus explained. Our party in July, 1935, carefully sieved all the pit refuse but could find no fragment of knives or any other signs of artifacts. What Mr. Isackson saw as the third knife was without doubt some thin pieces of lava in the gravels he was throwing out of the pit; he mistook them for a third knife because of their similarity in thinness to the knives.

covery, asked the writer to come and make an examination of the site. In company with Dr. W. D. Smith, professor of geology at the University, and others the writer proceeded to the site to make an investigation. We joined Mr. Fisher and Mr. A. C. Spenser, U. S. G. S., Geologist in charge, Deschutes Project Survey, and others and they conducted us to the site.

Careful examination of the walls of the pit as well as the soil which had been thrown out failed to show any further artifacts. There did not appear to be any means by which the knives could have slipped down from above. The walls of the pit showed under the thin layer of humus about thirty inches of pumice, then fifteen inches of old yellow soil and scattered pebbles, which was followed by fifteen inches of yellow sandy soil and unsorted gravel. This stratum was over a four to six inch stratum of partially cemented sand or near hardpan. It was just above this hardpan, resting on top of it, that the scrapers were found. In addition to Pit 4, Pit 3 and Trench I[58] were examined for signs of geological disturbances which might complicate the problem. There seemed no reason to believe there was any accidental deposition of knives from a fairly recent time, nor was there any doubt to be attached to the workman's story. The situation showed a deposit of two scrapers which were under pumice and water-laid soil and gravel. There was every reason to consider this discovery important as evidence of man's presence on the Deschutes in rather great antiquity. Since exploratory excavation at that time was impossible, Mr. Fisher agreed to keep Pit 4 open and fence it so that the site would be preserved until the following summer.[59]

The Deschutes River flows south and southeast from Crane Prairie Reservoir to Sec. 11, R. 8E. T. 22S where it is joined by Davis Creek. The river then continues east for about two and a half miles where it is diverted northeast by the rising mass of Wikiup Butte. A barrier from Wikiup Butte on the south to Pringle Butte about three miles to

[58] Trench I was cut down the steep north bank of the Deschutes to give a profile of the stratigraphic sequence.

[59] Permission to excavate was given by the U. S. Department of Agriculture, and the Supervisor of the Deschutes National Forest in which the site lay put the facilities of his office at our disposal. A grant from the Research Council of the University of Oregon and the Carnegie Institution subsidized the investigation. Maps, logs of test pits and other information was given us through the courtesy of Mr. R. F. Walter, Chief Engineer, U. S. Bureau of Reclamation, Denver, Colorado. Mr. C. L. Isted, Manager of the Shevlin-Hixon Company, gave us permission to camp on company property during the excavations. Judge Robert Sawyer, of Bend, assisted us in many ways.

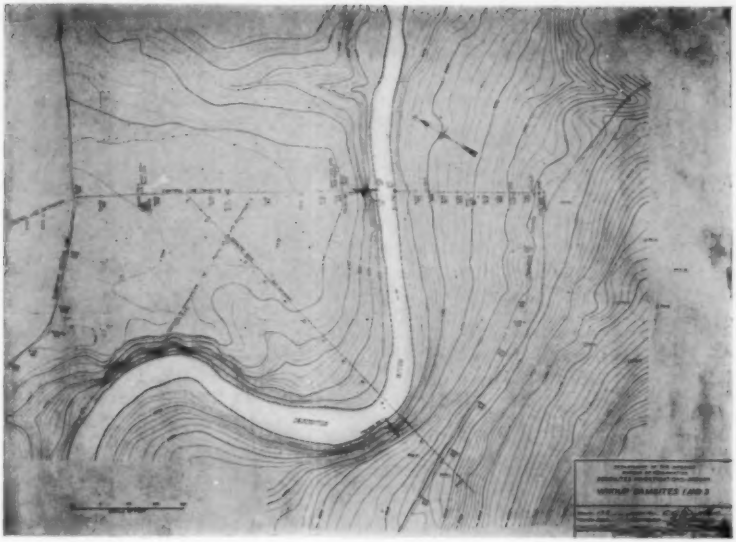

FIG. 1.—Wikiup Damsites 1 and 2 (Used by permission).

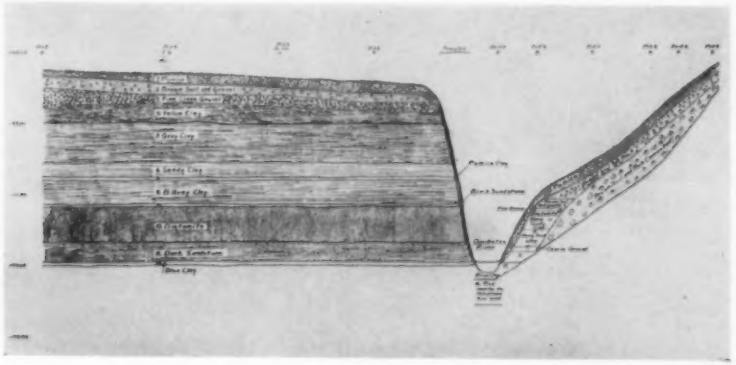

FIG. 2.—Profile of stratigraphic sequence, Wikiup Damsite No. 1, Control Line No. 1.

Wikiup Knives: upper, nodular surface; lower, external surface.

the north directs the flow northeast. The river level at the Control Line, Damsite No. 1, is 4260 feet. The banks on either side rise abruptly to just over 4300 feet, to contour 4310 (Plate I, Figure 1) on the North Bank at the Control Line. On the South Bank is a terrace. The triangle between Wikiup Butte on the south, Pringle Butte on the north and the Deschutes on the west, as it flows south and east from Crane Prairie Reservoir, lies between the 4300 and 4400 foot contours. This area extends about three miles north and west from the river between Wikiup Butte and Pringle Butte. This flat along the Control Line rises almost imperceptibly, 4.38 feet in a horizontal distance of 716.8 feet. The rise becomes slightly greater as one moves northwest. The whole flat is covered with pumice and a forest cover of jack pine which is replaced by yellow pine (*Pinus ponderosa* Lawson), as soon as the pumice layer thins out.

We laid off an area twenty feet square with its center close to the exact spot where the knives were found. Because we wished to avoid disturbing the concrete monument on Control Line Damsite No. 1, 14.478 (Plate 1, Figure 1) we could not exactly center the knife site. Figure 8 shows the location of the knives and Test Pit 4 with reference to the excavated area. The soil was removed in trenches five feet wide and down into the stratum of clear black gravel. This gave us an opportunity to examine the stratigraphic character of the immediate area and to discover if any other artifacts, bones or fossil material might be associated with the knives.

Plate 1, Figure 2 shows a profile of the area constructed from the logs of test pit records and drill cores. The strata of diatomite and clay clearly indicate the former presence of a lake with heavy deposits of sediment being laid down. The clean gravel and the soil and gravel in the next two layers toward the surface show stream action. This appears to be the result of terrace building. The gravel is subangular so that it could not have been transported any great distance. Between the clean-gravel and the soil-mixed-with-gravel strata there is a stratum of consolidated material suggesting hardpan. It is the same material as appears above in an unconsolidated condition. It was in the top surface of this harder stratum that the knives were found. Over the soil and gravel is a stratum of fine pumice followed by one of coarser material. Over this is the humus.

The south side of the river shows a stratigraphic sequence which does not correspond in detail with that of the north bank. This may be due to erosion which has cut out some of the strata to be found on

the north side in the upper levels. There is closer correspondence at the lower levels. The sloping surface of the underlying lava may have provided a much less stable bedding than on the north side. It is, however, quite likely that the upper part of the south bank has had a later history than the left.

This lake must have been considerably earlier than the one caused by the late lava flow from Lava Butte which dammed the river. The lavas from this late flow are not covered by pumice as are the sediments in the Wikiup area. It is impossible, therefore, to give the time of the earlier lake, the one represented by the sediments of our profile, except that it must have been Pleistocene or even earlier. The pumice deposits in the Wikiup region evidently come from two sources: a more distant one in the deeper stratum, as is shown by the finer quality there; and a closer one, as the larger pumice fragments of the top layer indicate. Both might come from the same source as a result of different periods of explosion. The pumice of the region south of the Newberry Crater is thought to be from Crater Lake and the Newberry Crater.[60]

The importance of this pumice is that it is post-glacial. Studies of Crater Lake made by Atwood,[61] Diller,[62] and Smith[63] have indicated that the glaciation was prior to the time when the final pumice was ejected from that crater. We may have, then, pumice deposited in very late glacial or early post-glacial times. The age of the top stratum of pumice, therefore, would be post-glacial.

Under this is the stratum of fine soil and gravel which Mr. Spencer personally thought was glacial outwash. How long it would have taken this to be deposited no one knows, probably not very long geologically. At a depth of two and one-half feet below the top of this stratum the knives were found resting on a hardened layer of the same kind of soil. The knives, then, must have been deposited in the late glacial or early post-glacial period, after the glaciers had started to melt but before the volcanic eruptions covered the country with pumice.

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[60] "The lavas in the southern half of the quadrangle are largely covered by a thin post-glacial deposit of granular pumice, partly from Newberry Crater and partly from some more distant source, perhaps the Crater Lake region, to the southwest." Department of the Interior, Geological Survey, publications listed in October, List 332, Reports, *Newberry Crater*, page 6.

[61] Atwood, W. W., Jr., *The Glacial History of an Extinct Volcano, Crater Lake National Park*, Jour. Geol., Vol. XLIII, No. 2, Feb.–March, 1935.

[62] Diller, J. S., *Crater Lake, Oregon*. Amer. Jour. Sci., Vol. III, March, 1897.

[63] Smith, Warren D. and Carl L. Swartzlow, *Mt. Mazama: Explosion vs. Collapse*. Bull. Soc. Am., Vol. 47, pp. 1809–30, 1936.

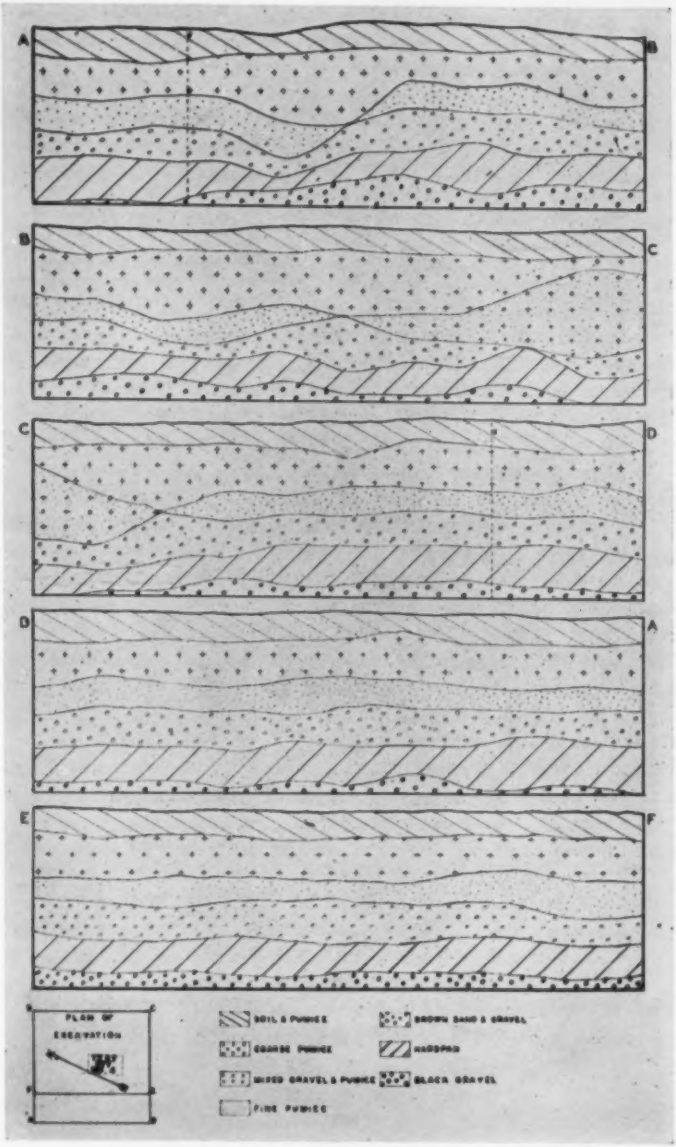

FIG. 7.—Profile of Walls of Excavated area.

The obvious questions are: first, are the knives intrusive, and second, did the workmen report this location accurately?

Our interview with Mr. Isackson who discovered the knives, the report on his reliability by his employer, the U. S. Bureau of Reclamation's Engineer in charge, Mr. C. A. Fisher, and his statement under oath all convinced us that the accuracy of his report of the location of the knives was not to be doubted. That question can be dismissed.

The other question can also be answered in the negative. The examination of the soil by the men who were recording it for the Bureau of Reclamation showed no disturbance. There was some evidence of a decayed tree root close to the point where the knives were found. While the soil here was somewhat softer than in the surrounding areas, it was too compact to permit the knives to work their way down. The two knives were found lying close together at the same level, so that they were picked up in the same shovelful of dirt. Because of the slightly different shapes of the knives, even if it had been possible for them to gradually work down, it is not likely that they would have brought up at the same place. There was no sign of any burrows of any animals which might account for them. Our minute examination two days later, of the soil above the site where they were found failed to show any disturbance either natural or by man. Had they represented a burial it would have had to have taken place before any humus had formed by the water-laid soil, and prior to the deposition of the pumice, as the lack of mixed soil indicated. Had this been the case they would still be close to the end of the glacial period. Figure 7, Section E, shows the profile of the trench wall just off the side of Pit 4, in which the knives were found. There is clearly no soil disturbance. The knives can be definitely said to be non-intrusive.

Figure 8 shows the location of root fragments, mostly reduced to charcoal, discovered first in the pumice layer; and in some cases these were followed down to the hardpan, although it could not be done in a continuous line in any case. Dr. Ralph W. Chaney of the University of California kindly made microscopic examination of specimens and identified them as conifers. The roots were grouped in a rough oval shaped area, while immediately to the west was a depression. Leading up to the roots was a slight mound of yellow soil pushing up into the pumice. This arrangement of roots, the slight rise in the soil about the center, and the depression immediately to the west suggested strongly an overturned tree. The depression in an otherwise fairly

even series of strata is shown in Figure 7, about seven to eight feet east from side "A" in wall "A–B." The tree may have been overturned by cataclysmic forces which deposited the pumice. The pumice might have been hot enough to ignite the tree which then burned, while the roots in the lower pumice and soil burned to charcoal; or the tree might have been fired later. The knives were well below the tree and not in any root hole. The tree must have grown on the water-laid terrace for some years before the pumice shower destroyed it. This would suggest some lapse of time between the lowering of the water level and the pumice deposition. There was, however, no stratum of organic matter visible between these two strata. Irregularity of deposition appears in wall "B–C," Figure 7, reaching a maximum at the corner where "B–C" "C–D" meet, where the fine pumice layer changes into one of pumice mixed with gravel. Outside of this area the entire wall structure of the excavation shows remarkable evenness of stratification.

The knives, obverse and reverse, are shown in Plate II. Specimen 1-758 (Catalog, Oregon State Museum of Anthropology) appears to be a highly devitrified obsidian. It is a slaty blue-gray in color with a soft texture. The other knife, specimen 1-759, is made from a glassy rock but suggests a very fine grained basalt. When examined under the microscope it is seen to belong to the glassy spheroidals. It is possibly this quality, the presence of the numerous spheroidal bodies, which accounts for the cruder workmanship in this knife. The spheroidal bodies prevented the controlled removal of flakes.

The nodular surface of the scrapers appears above in Plate II; the external surface, below. It appears in each case that some chipping had been done before the large flakes were detached. The nodular surfaces are not smooth faces which lay against the larger fragments, but have been reshaped by removal of large flakes detached by pressure applied to the edge. The outer surface shows the method of flake removal by edge pressure to produce the desired shape. Specimen 1-758 is thinner than the other; the thickness at the middle is 6 mm. and 8 mm., respectively. The edges are retouched only in part, as is shown in the photograph.

Two characteristics stand out: first, the presence of unretouched stems which might be striking platforms; and second, the thinness of the knives. These traits are not characteristic of the obsidian knives or scrapers of eastern Oregon. When a flake has been struck off a large nodule and used without working it down to an ovate form, it is usually

much thicker, like the type figured in the author's paper on the Guano Valley region.[64] In historic times this type of scraper is frequently found but must be classed as a temporary or hastily prepared tool among the exquisitely fashioned pieces from the region.

The striking platform does not appear in our scrapers from historic times, even in the rough type just discussed, but they have been retouched to give a sharp and even-cutting surface around the whole instrument. In the Wikiup knives, especially specimen 1-758, these blunt

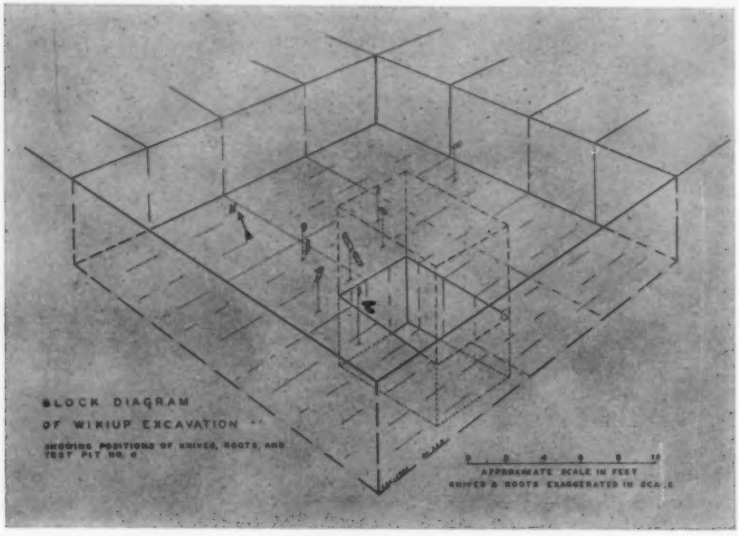

FIG. 8.—Block diagram of Wikiup excavation.

ends are very clearly defined, absolutely unretouched, and are to be found at both ends. Does it mean that the knives were unfinished? Hardly, because the immediate edges are retouched up to the platforms, but that surface is avoided. It hardly seems that the original flake was thinned by being struck at both ends. The conchoidal fractures so characteristic of obsidian do not appear in connection with these striking platforms, if they are that.

[64] Cressman, L. S., *Archaeological Survey of the Guano Valley Region of Southeastern Oregon*. University of Oregon Monographs, Studies in Anthropology No. 1, June, 1936, p. 40, Figure 17.

The historic knives from eastern Oregon represent some of the most beautiful stone products in North America. The use of obsidian favored this development. Scrapers and points show technical skill in their production worthy of admiration. The commonest form of knife is of an ovate shape which is beautifully chipped on both sides until it is symmetrical. The shape is produced by pressure chipping which removes long, often narrow flakes, sometimes producing a ripple-like surface. Others have been made by removal of progressively smaller flakes under carefully controlled pressure, until the entire piece is a beautifully shaped symmetrical instrument. The edges are finally retouched by the removal of minute flakes and, when entirely treated in this manner, the knife is complete. This product is quite different from the Wikiup knives, which still retain striking platforms (?), are shaped by the removal of large flakes only, are but partially retouched both on surface and edge, and are not symmetrical in any dimension.

The character of the knives suggests an early type, before the development of controlled technique which is such a striking trait of historic times for the region. There is no reason to compare them with Old World types. They are, however, more suggestive of late Paleolithic forms than anything else, the fairly decadent Magdalenian type, if one wishes to make such a comparison. We do not make it here to indicate in our mind any connection in techniques. The general nature of the knives fits in well with the probable geological period assigned. Since the detailed geology of the Wikiup Butte region has not yet been worked out, final opinion on the geological evidence cannot be given. No effort has so far been made to correlate terraces in eastern Oregon with the accepted continental glacial history. Allison[65] has attempted such a correlation for the Willamette Valley, but that does not help us here.

In conclusion we may say that we present this evidence to our colleagues for their consideration without insistence on the finality of the findings, but with a strong conviction that we have here one more piece of evidence to add to the rapidly accumulating series on glacial or early post-glacial man in the New World.

APPENDIX A

(COPY)

This is to certify that I, John F. Isackson, together with J. T. Brown, am employed by the United States Bureau of Reclamation in the excavation

[65] Allison, Ira S., *Pleistocene Alluvial Stages in Northwestern Oregon*. Science, Vol. 83, No. 2158, May 8, 1936, pp. 441–443.

of test pits at the Wikiup Damsite, located on the Deschutes River about five miles above Pringle Falls in Section Eight, Township 22 South, Range 9E. W. M.

On September 13, 1934, while digging Pit No. 4, located on the north side of the river about 250 feet south of the road and 850 feet north of the river and at a surface elevation of about 54 feet above the river level and at a depth of about 5 feet below the surface, we found three Indian Stone Artifacts (Knives). The material of the pit is from surface to two feet depth, pumice or pumice soil; two to five feet, brown soil and gravel with the bottom four to six inches more or less indurated, in which the artifacts were embedded; five to ten feet depth, dark colored clean, fine gravel resting on clay.

These artifacts were presented by Mr. Brown and myself to Dr. L. S. Cressman, Anthropologist at the University of Oregon, for donation to the museum at the University.

Dated at Bend, Oregon, this 24 day of September, 1934.

JOHN F. ISACKSON

Subscribed and sworn to before me this 24th day of September, 1934.

(*Notary Stamp*) ROBERT W. SAWYER
Notary Public for Oregon
My commission expires February 12, 1936.

APPENDIX B

Statement of soil stratification in pit No. 4; By A. C. Spencer, U. S. G. C., Geologist in Charge, Deschutes Project Survey, Bend, Oregon.

0 – 2′6″	Pumice
2′6″– 3′9″	Old soil with scattered pebbles, yellow
3′9″– 5′0″	Dirty unsorted gravel and sand, yellow
5′0″– 5′6″	Hardpan or cemented sand, 4 to 6 inches The blades were found just above this layer
5′6″– 8′0″	Clean unsoiled gravel and sand, black
8′0″–10′0″	Fine silt to bottom of pit

WIKIUP DAMSITES

Log of Test Pits

Pit No.	Elevation	Location		Log
DAMSITE No. 1 (Lower)				
2	4313	Sta. 8 55+Left Side	0′ – 3′	Pumice
			3′ – 6′	Brown soil and gravel
			6′ –10′	Fine clean gravel
			10′ –20½′	Clay
				* See seepage test
3	4314	Sta. 11+40 Same as	0′ – 3′	Pumice
		Drill Hole No. 3	3′ – 5′	Brown soil and gravel
			5′ – 8′	Clean fine gravel
(4 cf. Statement by A. C. Spencer,			8′ – 8½′	Cemented gravel

Pit No.	Elevation	Location		Log
App. B)			8½′–21′	Sandy clay
				Clay sample taken
5	4315	Sta. 17+30	0′ – 2′	Pumice
			2′ – 5′	Brown soil and gravel
			5′ –10½′	Fine clean gravel to sand stone
				Gravel sample taken
6	4280	Sta. 4 00+Rt. side	0′ – 2½′	Pumice
			2½′– 4′	Brown soil and gravel
			4′ – 4½′	Fine gravel
			4½′– 6′	Diatomite
			6′ – 9½′	Hard sandy clay
			9½′–14½′	Clay—very hard
			14½′–16′	Coarse gravel
				To bed rock
				* See seepage test
7	4289	Sta. 2+50	0′ – 3′	Pumice
			3′ – 6′	Brown soil and boulders
				To large boulders
8	4301	Sta. 1+00	0′ – 3½′	Pumice
			3½′– 6½′	Brown soil and rock
			6½′–11′	Brown soil and rock, cemented
			11′ –16′	Decomposed lava
				To bed rock
				* See seepage test
9	4322	Sta. minus 0+85	0′ – 3′	Pumice
			3′ – 5′	Brown soil and boulders
			5′ – 8′	Brown soil and boulders, cemented to large boulders
				* See seepage tests
10		Sta. minus 4—Right side	0′ – 3′	Pumice soil
			3′ – 4½′	Brown soil and rock fragments
		On high terrace Material Pit	4½′– 9′	Brown soil sand and rock to boulders
				Sand sample taken
11		Sta. minus 6 Material Pit	0′ – 3½′	Pumice soil
			3½′– 7′	Brown soil and rock fragments to boulders
				Sack sample taken

Pit No.	Elevation	Location		Log
12		200′ upstream from Pit #11 Material Pit	0′ – 4′	Pumice soil
			4′ – 7½′	Brown soil and boulders to bed rock
				Sack sample taken
13		200′ upstream from Pit #12 Material Pit	0′ – 4′	Pumice soil
			4′ – 6½′	Brown soil and boulders
			6½′– 8½′	Cemented sand and gravel to boulders
				Sack sample taken
14		400′ upstream from Pit #10 Material Pit	0′ – 4′	Pumice soil
			4′ – 9′	Brown soil and boulders to bed rock
				Sack sample taken
15		200′ upstream from Pit #10 Material Pit	0′ – 4′	Pumice soil
			4′ – 7′	Brown soil and boulders
			7′ – 8′	Dark soil and cobbles to boulders
				Sack sample taken
Damsite No. 3 (Middle)				
1	4296	Trench in right slope	0′ – ½′	Pumice soil
			½′– 3½′	Hard clay
			3½′– 5′	Pumice
			5′ –12½′	Hard brown clay
			12½′–13′2″	Sand stone
			13′ –24½′	Diatomite
			24½′–30½′	Friable sandstone
			30½′–35½′	Hard clay to river level
2		Right side—below road	0′ – 3′	Pumice
			3′ – 4½′	Brown soil
			4½′– 5½′	Brown soil and clay
			5½′– 9′	Clay and layers of sand
			9′ –10½′	Clay and pumice
			10½′–12′	Pumice
			12′ –18½′	Dark hard clay
			18½′–19′	Black sand—hard
			19′ –25′	Yellow clay very wet
3		Right side—above road	0′ – 4′	Pumice
			4′ – 7′	Brown soil and boulders
			7′ –10′	Hard sandy silt
			10′ –13′	Cemented sandy clay
			13′ –15′	Brown sand to clay

DESCHUTES PROJECT, OREGON

Elev.				Material, Description and Remarks
4263	River elev., 4260.4			
	0′	to	2′	Pumice soil
	2′	to	8′	Blue clay. Some yellow clay
	8′	to	12′	Red coarse lava sand—decomposed
	12′	to	15′	Lava sand. Some blue clay
	15′	to	18′	Gray decomposed lava. Broken
	18′	to	29′	Gray lava—porous and broken
	29′	to	35′	Gray, coarse grain porous lava
	35′	to	47′	Red decomposed lava sand
	47′	to	49′	Gray broken decomposed lava
	49′	to	51′	Gray porous broken lava. Lost the water at 51′6″ No water return below this
	51′	to	53′	Gray lava—porous
	53′	to	59′	Gray fine grain hard lava
	59′	to	64′	Gray broken lava
	64′	to	76′	Gray broken porous coarse grain lava
	76′	to	84′	Gray broken porous lava, with streak of red cinders at 76′4″
	84′	to	88′	Red lava cinders
	88′	to	90′	Red porous lava
	90′	to	90′6″	Red decomposed lava
	90′6″	to	97′	Dark porous lava. Broken up
	97′	to	98′	Red lava cinders
	98′	to	100′	Dark red porous lava
	Water table at 77′ (El. 4186) 15 hrs. after drilling stopped			
	Bottom of hole at El. 4163			
	Hole begun Aug. 21			
	Hole completed Aug. 24			

Location: On right bank of river near water surface. At Sta. 5+28 of Control Line

Wikiup No. 1 Damsite
Log of Test Hole No. 1
Aug. 1934

4311	0′	to	5′	Pumice soil
	5′	to	10′	Lava sand and some clay
	10′	to	16′	Coarse lava sand
	16′	to	17′6″	Gray porous broken lava
	17′6″	to	18′	Gray porous lava
				Lost the water at 17′
	18′	to	21′	Gray porous decomposed lava
	21′	to	23′	Gray broken porous lava
				Drove 2½″ pipe to 21′ and got water return
	23′	to	24′	Brown lava, porous and broken
	24′	to	26′	Pumice and sand

Elev.			Material, Description and Remarks
	26′ to	28′6″	Decomposed red lava
	28′6″ to	31′	Brown lava. Sandy
	31′ to	31′6″	Gray porous fine grain lava
	31′6″ to	38′	Dark gray coarse, porous lava Olivine
	38′ to	43′	Gray fine grain lava
	43′ to	44′	Lava sand and pumice Lost the water
	44′ to	47′	Dark coarse, porous lava
	47′ to	50′	Red decomposed lava
	50′ to	55′	Dark gray porous lava
	55′ to	62′	Gray fine grain lava
	62′ to	74′	Decomposed red lava. Soft
	74′ to	75′	Black coarse grain lava
	24 hours after completion of drilling water was standing at 42′; or 8.6′ above river		
4236	75′		Bottom of hole Drilling begun Aug. 27 Drilling completed Aug. 28

Location: Near flow line on right abutment, at Sta. 0+20 of Control Line

Wikiup No. 1 Damsite
Log of Test Hole No. 2
Aug. 1934

WIKIUP DAMSITE NO. 1

DRILL HOLE NO. 3
Drilling began 8-30-34—Drilling complete 8-31-34—Log submitted 9-6-34
Location: 550′ to left of river. Elevation: 54′ above river level.
Log—Brief of:

0′– 5′	Pumice soil
5′– 10′	Black sand and small gravel
10′– 25′	This is reported in the drill log as coarse black lava sand, but later a pit was dug to 21′ over the drill hole to recover some casing, and the clay was found below about 10′
25′– 55′	Clay—Water tight
55′– 85′	Sand, with layers of clay
85′– 95′	Clay
95′–126′	Pumice and sandy clay
126′–131′	Lava—porous

Lost the water at 55′. Returned when casing was put down to this depth. Water returned for balance of depth.
Small artesian flow at 95′.
Water table at 77′ depth, or 23′ below river level. This is with the casing in below the artesian flow.

TREE RINGS, VALLEY FLOOR DEPOSITION, AND EROSION IN CHACO CANYON, NEW MEXICO

DONOVAN SENTER[66]

EXCAVATIONS made in 1928 at the north wall of the large pueblo of Chetro Ketl in Chaco Canyon, New Mexico, indicated that there had been fourteen feet of sandy fill in the canyon at that point since the foundations of the pueblo were laid. Sherds in the walls of the Chaco arroyo likewise pointed to considerable fill since the occupation of the large Chaco pueblos in the late 9th to early 12th centuries. This has raised the question of rate of deposition on the valley floor and of land surface levels during and since the time of prehistoric occupation. Linked with the problem of old land surfaces was that of burials, which have been notable for their scarcity in this canyon, and it seemed that an investigation of these old surfaces might yield some information on the possibility of burial grounds deep below the present surface.

With these problems in mind, the Anthropology Department of the University of New Mexico decided to expand its 1936 field program to include the excavation of Chaco Mound 50 (Figure 9), and to allow cutting of one unit of a trench that will eventually cross-section the canyon. This section of the canyon is to be extended, eventually, from cliff wall to cliff wall along the line of projected stations.

Geological identification of erosion and deposition surfaces was combined with the technique of dating these layers from included sherds previously given dates by tree ring studies of charcoal found with the pottery in the Chetro Ketl dump.[67] The dated layers were then checked against the tree-ring master chart for the area to identify the wet and dry periods indicated in the old cuts and surfaces. This new combination of techniques, which functioned well here, may offer possibilities in connection with similar problems in other districts.

Station 1 was set up four feet from the south wall enclosing the great sanctuary of Chetro Ketl. From this point a line was run thirty degrees east of south to the edge of the arroyo, 1164 feet distant.

Cut 1 was begun between points 250 and 300 feet south of Station I. This cut, fifty feet long and twelve feet wide, was carried down six feet through the surface sand. At this depth the excavation was narrowed down to a width of six feet, and the length was shortened to twenty-five feet, between points 250 and 275 feet from Station I. The trench was

[66] University of New Mexico.

[67] Hawley, 1934.

carried down another six feet. The excavation was then narrowed to three feet wide and carried down six feet, giving a vertical face eighteen feet below the surface and twenty-five feet long. At the bottom was sand showing no trace of culture material. All potsherds encountered in this trench were saved and classified.[68] Sack numbers are entered in their place in the chart (Figure 10) to indicate the locality in which the sherds were found *in situ*, and classifications of the material in each sack are listed in the table of pottery. One complete vessel of Escavada Black-on-white was encountered at a depth of nine feet below the surface level in a layer of "cienega clay" in Deposit 2.

HISTORY OF DEPOSITION AND EROSION IN CHACO CUT I[69]

(1) Deposition (Deposit 1). Lowest and earliest in the cut. Sandy silt; little clay. Culminates with a deposit of "cienega clay" about five inches thick. Contains no sherds.

(2) Erosion (Erosion Surface 1). Erosion has cut Deposit 1, completely removing the "cienega clay" except for the north nine feet of the face of the exposure. Occupation of Chetro Ketl may have begun somewhat before or during this stage of erosion or at the beginning of the deposition which followed it.

(3) Deposition (Deposit 2). Silt and clay. At one horizon, at least, the silt and clay occur in alternating laminae, perhaps varves, indicating deposition in standing water. Within this deposit, at a depth of fifteen feet, were found sherds of Escavada Black-on-white of Gladwin's Wingate Phase. Above this in the deposit Escavada Black-on-white was consistently associated with Gallup Black-on-white (see sacks 3, 4, 5). At a depth of nine feet, in a layer of "cienega clay," an Escavada Black-on-white jar (specimen Bc52 $\frac{1}{1}\frac{0}{0}$) was found. The silty clay of this deposit merges into the "cienega clay" at the depth of nine feet in a layer between two and four inches thick. Thereafter the material increases in coarseness to fine sand, and then decreases in coarseness to clayey silt. This clayey silt seems to have formed a land surface, for it shows in places a thin grayish layer of ash, and is distinctly different from the overlying material.

(4) Erosion (Erosion Surface 2). As stated under Section three, the top

[68] Hawley, 1936.

[69] Interpretation of the history of the formations uncovered on the side of this cut was checked by Dr. Ernst Antevs of the Carnegie Institution of Washington.

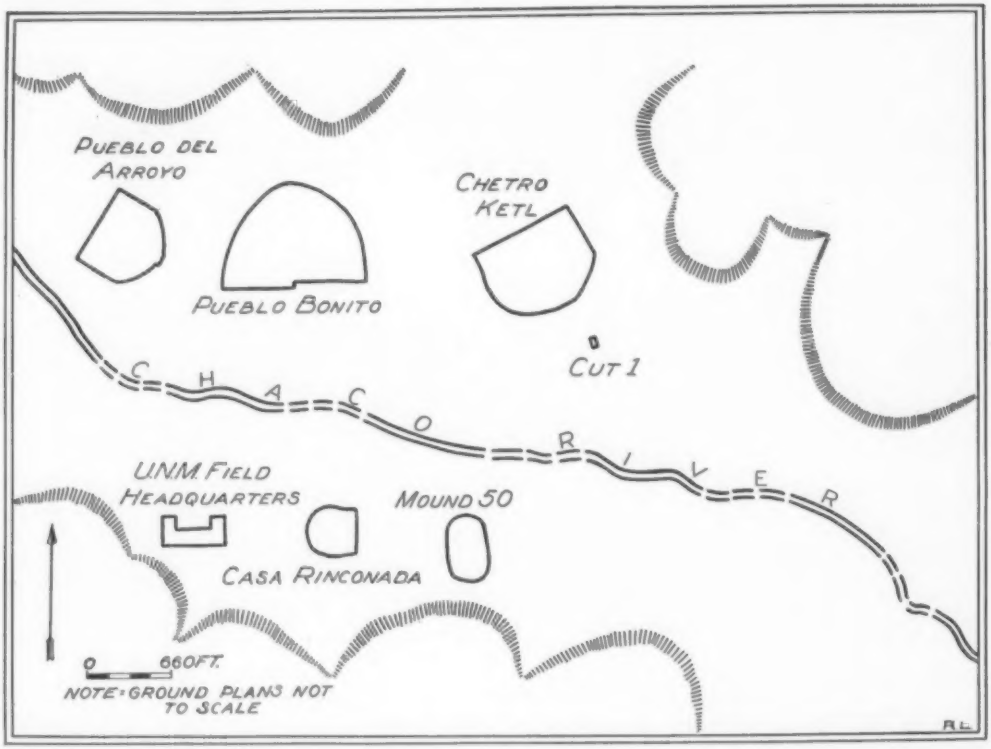

FIG. 9.—Schematic map showing relationship of Cut 1 to Chaco terrane and structures.

of the clayey silt seems to have been a land or erosion surface which rests fairly horizontally at the present level of about seven feet below the surface.

(5) Deposition (Deposit 3). The deposit in the uppermost seven feet is of sandy silt and gravel lenses. The gravel lenses represent a river deposit. Most of the sand and silt are probably of river deposits, but a part of them may have been laid down by the wind. It is possible that the river cut into the surface at places, but no definite period of erosion is evident. From a lens of gravel lying from four to five feet beneath the surface were taken sherds which were identified as preponderantly Chaco and Gallup Black-on-white of the Chaco Phase (see Figure 10 and Sack 1). A gravel lens farther south at about the same depth (see Figure 10 and Sack 2), but shown by its position in the bed to have been of an earlier period, contained sherds preponderantly of Gallup Black-on-white.

(6) Erosion (modern arroyo cutting). The main river, or the tributary, which had laid down Deposit 3, disappeared. In late time the modern river cut its present arroyo.

POTTERY PERCENTAGES FROM CUT 1

Sack No. 1 (Gravel Lens in Deposit 3)

Chaco Corrugated	22	42%
Chaco Black-on-white	17	34%
Gallup Black-on-white	7	14%
Wingate Black-on-white	1	2%
Escavada Black-on-white	3	6%
Red Mesa Black-on-white	1	2%
	51	100%

Sack No. 2 (Gravel Lens in Deposit 3)

Gallup Black-on-white	12	38%
Escavada Black-on-white	7	22%
Chaco Corrugated	6	19%
Chaco Black-on-white	4	14%
McElmo Black-on-white	2	7%
	31	100%

FIG. 9.—Schematic map showing relationship of Cut 1 to Chaco terrane and structures.

Sack No. 3 (Deposit 2)

Escavada Black-on-white	12	80%
Exuberant Corrugated	1	7%
Gallup Black-on-white	2	13%
	15	100%

Sack No. 4 (Deposit 2)

Escavada Black-on-white	11	50%
Gallup Black-on-white	3	13%
Exuberant Corrugated	3	13%
Red Mesa Black-on-white	2	11%
La Plata Black on white	3	13%
	22	100%

Sack No. 5 (Deposit 2)

Escavada Black-on-white	37	55%
Exuberant Corrugated	27	39%
Gallup Black-on-white	4	6%
	68	100%

Sack No. 6 (Deposit 2)

Escavada Black-on-white	39	91%
Exuberant Corrugated	3	7%
Affinis Gila Redware	1	2%
	43	100%

Dates on the preponderant pottery types were already known from work on the Chetro Ketl dump, in which Miss Florence Hawley used the charcoal thrown out with the daily household sweepings for dendrochronological dates on the associated pottery types. She concluded:[70] " . . . that the fine polished black-on-white ware (now known as Chaco Black-on-white)[71] was the most popular type during the last years of Chetro Ketl occupation. Semi-polished (Gallup Black-on-white) and unpolished (Escavada Black-on-white) ware appear to have been made at the same time, but according to the potsherd contents of the dated dump strata, they were more prevalent before polished (Chaco) Black-

[70] Hawley, 1934, p. 63.

[71] Hawley, 1936.

on-white ware gained its ascendancy. It is possible that the three types were actually successive in their evolutionary conception, but no data are yet available to substantiate such a theory. The hold-over of the cruder wares into the period succeeding that of their predominance is illustrated by dump material. The semi-polished black-on-white ware

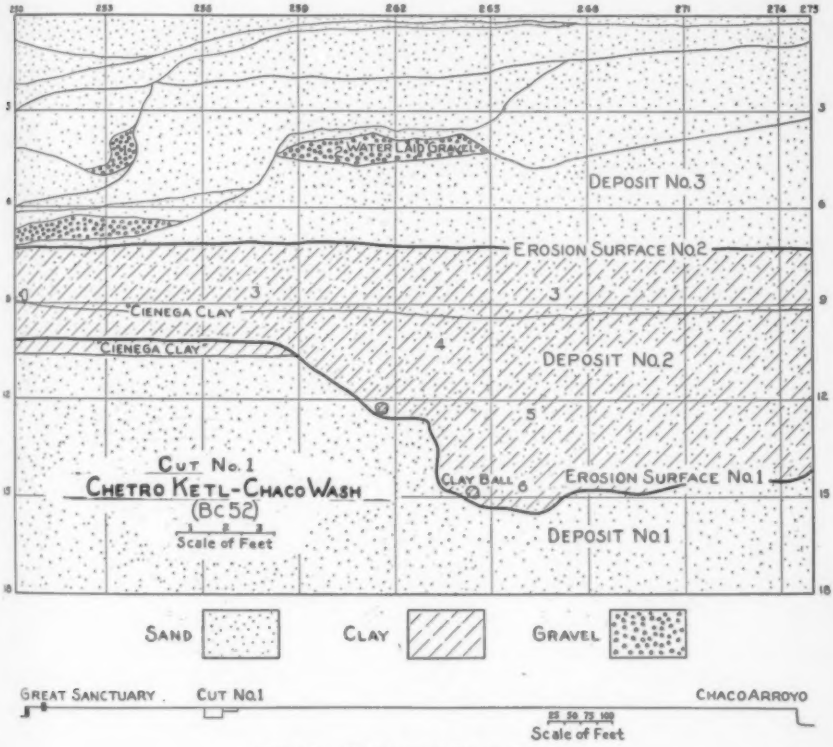

FIG. 10.—East face of Chaco Cut 1.

(Gallup) was prevalent at the end of the 10th century, as illustrated by material from stratum 4. The polished black-on-white (Chaco) was predominant from about 1084, when stratum 1 was begun, to about 1122, when stratum 4 was completed. How long before or after these dates this pottery may have been made we cannot say."

CONCLUSION

Deposit 1 was entirely sterile of sherd material. Sherds deposited after the period of erosion represented by Erosion Surface 1 in Deposit 2 were Escavada Black-on-white of the Wingate Phase, about 850 to 950 A.D. Erosion Surface 2 represents at least a period of cessation of deposition, but this was probably not a period of considerable erosion. Above this surface in Deposit 3 the sherds represented both Gallup and Chaco phases, which ran from about 950 to 1130 A.D.

It seems apparent that there was a period of extreme erosion in the Chaco some time before, or early in, the 10th century, followed by the deposition of Escavada Black-on-white sherds in Deposit 2, and that sometime in the 11th century there was a cessation of deposition, followed by Deposit 3 which contained Gallup and Chaco Black-on-white sherds. The earliest occupation on Chetro Ketl, it would appear from these data, occurred during a wet period and continued into a period of increasing dryness.

Checking these erosion-deposition data against the weather fluctuations known for the prehistoric Chaco through the tree ring chronology, we find a gratifying coincidence. Chetro Ketl was occupied some time before the drouth of 900 to 907 A.D.The exact date of occupation cannot yet be given, as much of the pueblo remains to be excavated, but the century can be figured by wall and pottery types which have been dated elsewhere. This drouth may have been responsible for the erosion of Erosion Surface 1, after which the Escavada sherds were laid down, about 950, in Deposit 2.

The following years were of average rainfall with occasional dryer years, until 1035, when a seven-year drouth began. This drouth was less severe than the preceding one, and appears to have had no great affect upon the people, who carried on the expansion of the pueblo as before. Erosion surface 2 is probably representative of this period.

The deposition of Deposit 3 represents a post-drouth period, probably from about 1050 or 1100 A.D. onward. Both Gallup Black-on-white and Chaco Black-on-white, the two types found in this stratum, were being made at the end of the 11th century.

The fluctuations in rainfall attested in the successive erosion and deposition surfaces indicate that if progressive dessication of the area occurred, it was due not to a climatic change but perhaps to recession of the forest border dependent upon human despoliation, and to subse-

quent erosion and lowering of the water table, as suggested by the Douglass theory.[72]

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[72] Douglass, 1929, 1935.

CORRESPONDENCE

On Standards for Texture in Pottery

An article on *A Method for Determining the Texture of Pottery*, by Hargrave and Smith, Volume II, No. 1, American Antiquity, brought to the writer a ray of hope that here at last was a standard which would enable the student to describe eastern pottery in terms which would be understandable to the Southwestern specialist. Any step in this direction is to be hailed with delight by those who face the problem of working on New England pottery. But a method for determining texture should be universally applicable, and available to the student working on pottery from Maine, or Mississippi, or the Mesa Verde. Otherwise the standard should be qualified in such a way that everyone will understand that it is intended for exclusive use in one particular region.

A few cases in point may illustrate the problems that face us. In the comparatively small amount of pottery from New England available in the Department of Archaeology, Andover Academy, there are discernible two main classes of tempering material. One is shell; the other is mineral, usually sand, although mica may be employed on occasions. One or two sherds give a slight indication that there may be a third group of vegetable fibre or grass temper. The mineral temper may range from sand, so fine that it will pass through a coarse cotton handkerchief, to gravel and pieces of granite. The gravel pebbles are water-rolled and reach a diameter of approximately 3 mm. to 4 mm. The pieces of granite show no rounding of the edges, such as is found on the pebbles, and may well have come from crumbled fire-stones, or from material pounded from weathered surfaces. In one specimen the actual size of the tempering material ranges up to $8 \times 3 \times 6$ mm., with the common run at about $2 \times 2 \times 3$ mm.

The shell temper varies considerably according to the amount of pounding. The size of the tempering material again may range up to 5×8 mm., with thickness varying with the pounding. Some of the finer pottery shows flakes of temper not greater than 0.5 mm. in any diameter.

We have in addition a distinct problem in the texture (in the strictest sense) of the body of some of the vessels. The tempering material is extremely fine, so fine that it requires an eight-power glass to see it; this material and the clay are very well mixed and form a thoroughly uniform smooth paste, yet the texture of the core is decidedly granular. When broken, one of these vessels will not show a clean cleavage line, but a very irregular one from the edges of which "grains" of pottery are easily detached. If the pottery has been in a very damp place it will tend to crumble along these cleavage lines, breaking into small pieces, about 2 mm. on a side, which absolutely defy restoration.

We are thus faced with two problems in attempting to fit the method suggested by Hargrave and Smith to our New England pottery. First, we have a range of coarseness going far beyond their "very coarse"; Jeditto Plain never

contained anything approaching the coarsest temper to be found in Maine. The second problem arises from the use of shell temper which gives a very different texture to our pottery. No matter how finely the shell may be pounded, there is, in certain cases, a rather flaky or scaly texture that cannot very well be compared to anything in the Southwest. Finally there is this matter of a paste apparently well levigated and with a very fine temper, but which breaks into crumbs that give the core a really granular texture.

An attempt to set a standard for determining the texture of pottery must certainly be hailed by all archaeologists interested in ceramic studies. Shepard[73] suggests, and I think wisely, that "experience will prove whether it will be advisable to expand the standard definitions evenly to divide the entire range of grain sizes found in pottery, or whether it will be more practical to use special terms for these somewhat exceptional materials. The first alternative would have the disadvantage of making too broad the terms which cover the range found in the majority of pottery types. The word gravel might possibly be used, or textural terms applied to an exceptional kind of temper could be defined independently; 'coarse shell,' for example, might describe a different size than 'coarse temper.' The problem will have to be worked out by those familiar with the range of materials and the number of subdivisions required . . . The subdivisions established in geological usage have been found adequate and satisfactory for the description of both Southwestern and Middle American paste textures."

It would seem wise to confine one's standards to the particular region under discussion, and to so define the standards that workers in other fields may append their data to that already in hand. Miss Shepard has made a step in this direction. While it is true that instruments for fairly precise measuring are necessary to continue her scale, it has the advantage of being entirely objective, since her grades are defined metrically. Her standards are, therefore, more readily available to people outside the Southwestern field than are the wares suggested as standards by Hargrave and Smith. It is possible to add to her scale with definitions that may be understood by all without getting involved in the difficulties surrounding any introduction of subjective elements into the picture. In this way only can a truly standard method be worked out.

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CERAMIC STUDIES

During the past five years or so, particularly in the Southwest, the increasing recognition of the importance of pottery has led to some very detailed ceramic studies. Thus it was with a great deal of interest that we, of the Mu-

[73] Shepard, Anna O., *The Technology of Pecos Pottery*, in *The Pottery of Pecos, Volume II*, by Kidder and Shepard, New Haven, 1936, pp. 410–411.

seum of Northern Arizona, examined the sherds described and pictured by Charles Fairbanks in his article in AMERICAN ANTIQUITY for January, 1937.

Sherds have proven to be of the greatest aid in chronology building in this section of the country, and probably will be of almost equal importance in other regions of the United States as more detailed studies are undertaken. By segregating, naming, and describing sherd types, it is possible in turn to date, in actual years, most of the ruins in the Southwest. More than this, cultures and sub-cultures may be established with the aid of sherds.

The relation of these various ceramic influences is, at the present time, absorbing the interest of a large number of Southwestern workers, even suggesting to them the division of what had previously appeared to be uniform cultures into what at present appear to be mixed ethnic groups. If these ideas are eventually satisfactorily demonstrated, it will be possible through time, area, and culture differences, reflected primarily by ceramics, to point out the direction of influences and, perhaps, even migrations of peoples.

In any such serious ceramic studies superficial characters must be superseded by basic methods. For example, it would at present appear that the best criterion of time is decoration; or more specifically, design. This feature was apparently widespread in area and changed rapidly, for design elements were almost certainly exchanged freely, even between distinctly different cultural groups. Conversely, such important factors in basic methods of manufacture as the type of atmosphere in which pottery was fired (oxidizing and reducing), the nature of temper (whether artificially prepared, such as crushed sherds or rocks, or unprepared inclusions, such as sand), and the actual method by which the vessel was constructed, appear to be distinctly confined to certain cultures.

For some time it has been felt (again particularly in the Southwest) that three main methods of pottery construction were employed. First, typologically, and so most simple, was the method whereby a vessel was manufactured by molding with the fingers from a lump or mass. The earliest vessels in the Southwest have generally been considered to have been made by this method. Second, vessels were shaped from coils or ropes of clay, which were later smoothed down, scraped, and rubbed, or left as plain or indented corrugations. Third, there was the method of coiling and then finishing by the use of an anvil held inside the vessel, and a paddle outside. These are usually designated as molding, coiling, and paddle-and-anvil techniques.

Recently some question has been raised as to the distribution of these various methods, and in fact even as to the existence in the Southwest of the first. A few years ago the writer became very much interested in the possibility of developing some means of determining whether vessels had been coiled or molded. Various tests were attempted, such as sectioning and staining, or breaking down with acid, but all with indifferent success. It is of course likely that further experiments would develop more reliable means of determining these methods, but in the meantime the reporting of unquestionable material,

such as that uncovered by Mr. Fairbanks, is of the utmost importance to our records. Not only will the noting of the distribution of these basic methods be of value to the Southwestern archaeologist, in the determining of small areas of distribution, but it will more than likely be of even greater importance to the general field.

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ARCHAEOLOGY OF THE SOUTHERN BLACK HILLS

In that part of the Black Hills lying broadly between Edgemont and Hot Springs, South Dakota, there are many interesting archaeological sites which have to some extent been brought into public light in the past few years. The district lies in the outer rim of the Black Hills formed by the sandstones of the Dakota and Lakota formations. This "hog-back" rim, as it is called, is cut transversely by many narrow canyons. One of the larger and better known of these is Red Canyon, which empties into the Cheyenne River about two miles below Edgemont.

The Red Canyon vicinity was formerly my home stamping ground. I have ferreted out old camp sites and petroglyphs in the locality and have seen some of the latter in the most out-of-the-way ravines as well as along the main canyons. The sandstone cliffs and large boulders furnish a multitude of smooth surfaces, and petroglyphs are rather plentiful. The figures range from a short straight line to complicated panels of lines and circles, and from a lone zoomorphic figure to large panels portraying groups of such figures interspersed with apparently symbolic figures. Although most of the work is of the pecked type, there are a few incised figures and some very interesting panels of painted pictographs. The latter are in red, black, yellow, and gray, but apparently no combination of colors in any one figure.

The pecked work may be divided into three types, as follows: Type 1—panels consisting mainly of zoomorphic figures usually accompanied by a few symbols (no horses or riders are shown); Type 2—panels of connected lines, but no animal figures; Type 3—scattered singular lines and symbols.

The pecking is usually not deep, merely the weathered surface having been pecked away. A new surface exposed in this manner stands out in contrast to the reddish-brown, buff, or black of the weathered surface. The pecked over surfaces have now weathered to the color of the surrounding surface. On one panel I visited, the wash from an iron concretion in the sandstone had formed a patination over figures below. At one site in an east branch of Red Canyon, zoomorphic figures can be seen at a height of approximately twenty feet from the present base of the cliff. Here is a large panel of Type 1 variety. Below it and within easy reach are a few incised figures and some of Type 3.

Local efforts have been made to use the petroglyphs, popularly called "Indian writings," as a drawing card. I am sorry to say that these efforts have

produced somewhat harmful results, as many of the curious who come to see feel that a panel would not be complete without additions or alterations of their own. Consequently, some of the better known panels have been mutilated despite warning signs placed by the U. S. Forest Service.

The pottery of the district is tempered with rather coarse quartz grit, such as seen on hundreds of ant hills in the locality. Some potsherds show imprints of a cord-wrapped paddle, while others show a more or less smooth surface. Decorations were either incised or cord-imprinted and confined to the rim, although I saw sherds from one pot which was decorated on the sides by vertical parallel lines interrupted by diagonal sets of parallel lines. Most of the rimsherds show a rim much thicker than the walls; others show rims of about the same thickness as the walls, usually curving outward. Rimsherds of one pot show a high rim thicker at the base than at the top and presenting a slightly concave vertical inner surface. This rim was apparently that of a large-mouthed vessel. Three complete pots which have been found in the district have round or egg-shaped bottoms.

There are numerous campsites in the region. Tepee rings mark many of the sites in exposed places near water holes or on high, bare knolls and ridges affording a wide view of the Cheyenne Valley. Other sites are marked by camp remains, such as campfire debris, broken stone implements, nuclei, flakes, discards, and, in some places, pottery fragments. Such sites are found at protected spots in the pine timber near waterholes, or in the open along water courses. There are also many cliff shelters and a few small cave shelters. I excavated in one of the latter in 1933. I found several end-scrapers, arrow points, a few bone awls, a clam shell, a potsherd, charcoal, burnt bone, a broken hammerstone, and many flakes and discards.

The stone implements are mostly of quartzite, chert, and chalcedony. The quartzite seems to have been preferred and probably came from the aboriginal Flint Hill quarries on a high ridge a few miles to the east of Red Canyon. The other materials are found locally in gravel deposits washed down originally from the inner Black Hills.

I would like very much to hear from neighboring and other localities, particularly regarding petroglyphs.

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CREDIT DUE

Due to an oversight, credit was not given to Dr. James B. Griffin of the Eastern Ceramics Repository at Ann Arbor, Michigan, for advice and other assistance given us while we were preparing the manuscript of *Chapters in Nebraska Archaeology*. Dr. Griffin placed some of his unpublished manuscript at our disposal, wrote lengthy letters in response to our questions, and conferred

with us on at least two occasions. Needless to say we are greatly indebted to him and so wish to take this opportunity to express our appreciation.

We feel in fact that our book is in many ways a coöperative project. Our other colleagues, including W. C. McKern, Thorne Deuel, Fay-Cooper Cole, and Carl E. Guthe, were called on for advice and responded just as freely. Any merits which the publication may have are largely due to the unstinted advice of our many colleagues.

EARL H. BELL
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NOTES AND NEWS

Pacific Coast Area

Under the direction of Dr. L. S. Cressman, the Oregon State Museum of Anthropology, University of Oregon, is planning to complete the excavation of Catlow Cave No. 1, in southeastern Oregon, this summer. The Carnegie Institution has made a grant to enable the completion of this project. It is hoped that the research will provide a culture column for that region which will serve as an effective reference key for future work. The workers entertain prospects of finding evidence of Early Man in the cave. (*E.W.G.*)

The following news items have been received from the Southwest Museum at Los Angeles.

Director F. W. Hodge's new book, *The History of Hawikuh*, is in press and will doubtless appear before these notes are printed. This volume will be the first publication of the *Hodge Fund*.

Miss Frances Densmore is working upon a new study of Indian music to be published by the Southwest Museum through the generosity of a friend.

Mr. and Mrs. William H. Campbell, Fellows in Archaeology, with their collaborators are preparing a report on new and important archaeological discoveries made by them in the California desert.

A branch of the Federal Art Project sponsored by the National Park Service is still at work at the Southwest Museum, turning out dioramas, costumed figures, and illustrations of Indian life for the museums of the National Parks and Monuments and for the Southwest Museum. Curator M. R. Harrington is in charge of the project, which numbers twenty workers.

Mr. Edwin F. Walker, Research Associate, is conducting stratigraphic investigations at an ancient campsite near Palos Verdes with a view to determining the sequence in time of the various types of artifacts characteristic of this region. (*E.W.G.*)

Plains Area

The U. S. National Museum is starting archaeological field operations in Kansas, under the personal direction of Dr. Waldo R. Wedel, Assistant Curator, Division of Archaeology. It is planned to excavate a village site near Kansas City which is reported to produce an abundance of Hopewellian-like potsherds.

It is planned next to examine a village site near Doniphan, which has been identified with reasonable accuracy as the site of the Grand Village of the Kansa from about 1700 to 1750, supposed to have been visited by Bourgmont (1724) and other early French explorers. The site is extremely prolific in culture detritus, and it is hoped that the direct historical method may here be employed to produce information on an archaeological culture complex for the proto-

historic and, possibly, prehistoric Kansa. Mounds and burials are reported for the vicinity.

If possible, a village site on the Blue River, where the main village of the Kansa stood during the closing years of the 18th and the early 19th centuries, will be studied. This site is shown on maps dated 1796, 1802, and 1819.

In addition, it is planned to conduct investigations at a large Oneota village site on Wolf Creek, comparable and possibly contemporaneous with the Leary Site.

Eventually it is hoped to determine for Kansas, as a primary result of investigations at sites that can be conclusively shown to have been occupied by known historic tribes, an historic Siouan basis comparable to Pawnee in Nebraska, from which to proceed backwards into definitely prehistoric manifestations with which the area abounds. (*W.R.W.*)

Dr. Loren C. Eiseley has been appointed Assistant Professor in Anthropology (Department of Sociology) at the University of Kansas for the coming academic year. The Administration of the University is well aware of the importance of the archaeological problems which may be solved in this area, and the appointment of a full time anthropologist is the first step in what is hoped will eventually be a more intensive local research program.

A group of enthusiastic amateur archaeologists, headed by Mr. Clark Field of Tulsa, started work last fall on the organization of the Oklahoma State Archaeological Society. This society received its state charter on October 31, 1936, with purposes incorporated: To promote the conservation of archaeological sites and monuments and to preserve the sundry Indian artifacts; to promote and encourage scientific research and to discourage careless and misdirected activity; to promote, establish and maintain an adequate museum building; and other worth-while purposes.

This organization is working in direct contact with Dr. Forrest E. Clements, Head of the Department of Anthropology of the University of Oklahoma, and coöperating with him in every way.

As young as the society is, it has started on a survey of the archaeological sites in Oklahoma, following the data sent by the National Research Council. This survey is expected to last at least ten years, starting with the northeast quarter of the state.

This group has had four meetings so far. The business meeting in January included an afternoon session and a dinner, followed by papers by Erik K. Reed of the National Park Service and Dr. Clements. On April 24 Dr. S. C. Dellinger of the University of Arkansas spoke on the Bluff Dwellers Culture, and Fred Carder, in charge of the Spiro Mound, under Dr. Clements, spoke in the afternoon. The evening program was addressed by Mr. B. A. Wetherill of Sand Springs, Oklahoma, discoverer of the Mesa Verde in 1873, who gave a very interesting paper on Mesa Verde and his work with Baron Nordenskiold

in 1883. Dr. Dellinger followed with an illustrated lecture on the Mound Builders of Arkansas.

The society has had field trips under Dr. Clements supervision, and has others planned. At the May meeting it is planned to meet jointly with the Central Texas Society.

The membership is increasing rapidly, members coming from all parts of the state, and all are extremely enthusiastic about the work planned, hoping some day, through the help of Dr. Clements and other archaeologists, to have a very outstanding organization. (*Dorothy F. Morgan.*)

Northern Mississippi Area

A Lithic Laboratory for the Eastern United States has been set up at the Ohio State Museum, Columbus, Ohio. When fully equipped and organized, it is proposed that this laboratory will serve in the identification of stone archaeological specimens for the mutual benefit of students throughout the area. Specialists, through a growing accumulation of pertinent data, will attempt to dispense information on the mineralogical nature, geographical source, and technical method of production (for artifacts) of all materials sent in for analytical study.

The project is being financed by members and friends of the Ohio State Archaeological and Historical Society.

It is hoped that many important problems centering about the antiquity, migrations, trade practices, and cultural development of the American Indians may be brought nearer solution due to these lithic studies.

Mr. H. C. Shetrone, Director of the Ohio State Museum, is now in England engaged in a study of the methods and techniques of the flint knappers at Brandon, where the world's oldest surviving industry continues to flourish. This study is intended to facilitate the Lithic Laboratory's study of American aboriginal methods of chipping stone.

Northeastern Area

From Dr. Warren K. Moorehead of Phillips Academy comes the following note:

"I shall endeavor to condense in so far as possible several tasks on which I have embarked. Now that I am past 71, it is necessary to put in shape for publication data resulting from past performances. Thanks to the kind coöperation and assistance of Dr. Arthur C. Parker, Mr. Wm. A. Ritchie, Mr. Roland B. Hill, Mr. Wm. B. Marye, and others, we have nearly completed the manuscript, *The Susquehanna Expedition of 1916*. There are certain changes and additions. We have endeavored to make the bibliography quite complete.

"Explorations conducted by me for the University of Illinois many years ago, and later by my successor, Dr. A. R. Kelley, are being prepared for publication. This is especially necessary since Dr. Fay-Cooper Cole's researches

have just been published. Some time next winter the report will be issued.

"During the past seven years, I have been engaged upon a study of the stone axe and its variants. Dr. Douglas Oliver has kindly consented to describe European forms and distributions. Mr. Fred Johnson will present technical study and classification of types. I shall write generally concerning distribution of types in this country. Thus, there will be three authors.

"I have been asked to prepare for publication my personal diaries of fifty-one years in archaeology. The narrative is non-technical and may interest my many friends, and will not be published for one or two years." (*W.A.R.*)

Douglas S. Byers and Frederick Johnson of Phillips Academy will complete this summer their excavation of the Nevin shell heap at Bluehill, Maine, reported in this section of the January number, 1937, and begin work on another, in the same region, which lies very close to a Red Paint culture site. (*W.A.R.*)

The archaeology of the Richelieu River Valley and of Prince Edward Island, in the Gulf of St. Lawrence, will be investigated by W. J. Wintemberg of the National Museum of Canada during the coming field season, and later, in coöperation with the University of Western Ontario, he will examine what is believed to be the site of Fort St. Ignace, in Simcoe County, Ontario, where in 1649 the Jesuit Fathers Jean de Brebeuf and Gabriel Lallemant were tortured to death by the Iroquois. (*W.A.R.*)

Under the supervision of Dr. Arthur C. Parker of the Rochester Museum of Arts and Sciences, Carleton H. Burke is recording Seneca folk music, ritualistic chants, and folk tales on acetate records by means of a Fairchild Sound Recording Apparatus in the museum's new recording room.

Archaeological field work, conducted by William A. Ritchie, assisted by John H. Bailey and others, began in April with the excavation of a prehistoric Iroquois site near Geneseo, in the Genesee Valley, which was about to be destroyed by highway construction. Nearly a dozen refuse pits and twenty-three burials were found. An unusual feature was the presence of grave goods (pipes, celts, bone awls and fishhooks, a turtle shell rattle, and beads of bone and shell) with some of the skeletons.

One burial of the late Algonkin period (Owasco Aspect), accompanied by a pipe, awl, bone flaker, and two fishhooks; a refuse pit of this occupation, containing among other things the sherds of a large restorable pot; and an early Algonkin grave (Vine Valley Aspect) lined with mica and provided with massive shell beads, beaver incisors hafted in antler, and numerous bone artifacts, occurred on the same site. The latter was about sixty feet from the Iroquois burials and was the only remnant of a cemetery of fourteen early graves destroyed a number of years ago in gravel digging.

Early in May, William A. Ritchie and Charles F. Wray discovered another low burial mound on the Squawkie Hill site (described in the last January issue

of this journal, pp. 183–186). Another Hopewell trait was added to those already found by the presence of a cremated burial on the floor. On one side had been placed a white adze and a mass of specular hematite; on the other, a semi-circular arrangement of thirty cache blades and some small sheets of mica. Further investigations are planned for this important site.

The museum's field work will be conducted this summer in western, central, and eastern New York. (*W.A.R.*)

Dr. Frank G. Speck of the University of Pennsylvania will continue his field studies in the following subjects: the songs and ceremonies of the Eastern Cherokee, which are being recorded on disks; social organization of the eastern Siouan tribes with special reference to the Catawba; and the ceremonies of the Canadian Cayuga and the Delaware-Munsee. The Museum of the American Indian, Heye Foundation, is now publishing his monograph on *Montagnais-Naskapi Art in Birch Bark, a Circumpolar Trait.* (*W.A.R.*)

Dr. Mary Butler of the Pennsylvania Historical Commission has just completed the report on her important work in southwestern Pennsylvania, briefly described in this section of the last issue. It is entitled, *Three Sites in Somerset County, Pennsylvania*, and will be published by the commission. (*W.A.R.*)

South American Area

Mr. and Mrs. Junius Bird of the American Museum of Natural History have returned from two and one-half years of archaeological survey in the southern Chilean archipelago and coast south of Lat. 41°30′, and the northern shore of the Straits of Magellan inland to the Argentine border. In 1931–32 Mr. Bird spent several months excavating shell mounds on the north side of Navarin Island. This work was continued on the last trip, 1934–37, and included excavation of rock shelters, caves, and shell mounds. The result of this intensive investigation is the stratigraphic isolation of two coastal and five land cultures, distinguishable on the typology of their hunting implements and weapons. Some of the outstanding finds are mentioned here, although the detailed report has not been prepared as yet.

(1) The extinct sloth, the horse, and a large animal as yet unidentified were found in positive association with the two oldest land cultures at Pale Aike and Rio Chico.

(2) The bola is more ancient than the bow and arrow in this region.

(3) Land people apparently reached the region before the canoe users.

(4) Polished stone celts are late; just pre-Spanish north of the Straits, and not found at all south of the Straits.

(5) Pottery does not appear before the Spanish horse, iron, and trade beads. (*W.C.B.*)

On March 30 Boston College opened a new museum with an exhibit of the

San Augustin collection made by Dr. Hermann von Waldegg, director of the museum. Dr. Waldegg plans another trip to the same region in May. (*W.C.B.*)

Mr. and Mrs. Alfred Kidder, II, of the Peabody Museum of Harvard University are sailing in May for an extensive survey of the Peruvian archaeological region. They plan to visit the principal collections and sites in preparation for teaching and further research. (*W.C.B.*)

Dr. Julio C. Tello of the University of San Marcos, Lima, leaves in June for an archaeological survey of the little-known region on the eastern slope of the Andes. He plans to visit the headwaters of the Huallaga, the Ucayali, and the Pucara rivers in seeking the possible distributions of highland ceramics. (*W.C.B.*)

Miss Isabel Guernsey of the Peabody Museum of Harvard University leaves in May for Peru where she plans to study the famous Paracas mummy bundles and textiles. Miss Guernsey has been appointed by the Institute of Andean Research as its candidate for the Mrs. Truxtun Beale fellowship. (*W.C.B.*)

Mr. Donald Collier of the University of Chicago has received the Mr. and Mrs. Robert Woods Bliss fellowship from the Institute of Andean Research for conducting research in the Peruvian archaeological field. He plans to leave in May for Peru where his work will be conducted under the general supervision of Dr. Julio C. Tello. (*W.C.B.*)

Dr. Luis E. Valcarcel, Director of the Museo Nacional of Lima, has gone to Paris to present a Peruvian exhibit of art and archaeology at the exposition. He plans to visit the principal museums of Europe on this trip. (*W.C.B.*)

General

The following announcement of general interest to all who are concerned with problems of documentation has been sent in by Mr. Watson Davis, Director, Science Service.

"The World Congress of Documentation will be held in Paris, August 16–21, 1937, with the coöperation of such international organizations as the International Institute of Documentation. Dr. Jean Gerard, *President de l'Union Française des Organismes de Documentation*, has asked me to tell you about the plans for the Congress and ask your coöperation in connection with American participation. The Congress will be held coincidently with the Paris Exposition. The enclosed statement gives the scope of the Congress.

" 'Documents, manuscripts, printed or otherwise recorded, by means of which knowledge is transmitted, and the number of which increases daily, are preserved in archives, libraries and similar institutions, which arrange them and make them accessible. Catalogues, indexes and bibliographies permit enquirers to cull from these collections the references required. Moreover an ever increasing degree of specialization has led to the formation of centres, the ac-

tivities of which are limited to a single branch of science or technology. The different activities of all these organizations and the methodical use of them are included in the term Documentation.

" 'The rapid progress of all branches of knowledge and the resultant applications set an even heavier task for this documentation.

" 'In many fields of human activity technology is applied science; public or private businesses can only be carried on when surrounded by sources of information; even the nations which are farthest apart are today in close and continuous contact; the masses take their share in the intellectual sphere. These four aspects of the modern development of communities have necessitated the widening of the traditional idea of the realm of the printed document to include its complements or substitutes: the film, the record, the sample and the model.

" 'An enormous number of people is concerned. Authors: writers, men of learning and their organizations, learned societies, literary groups, etc. Producers: printers, publishers, the daily and periodical press, booksellers. Documentary organizations: archives, libraries, documentation centres and museums, whose aim is to preserve the documents and facilitate their use by research workers; and lastly the users. All are concerned with the emergence of a rational organization of documentation.

" 'The International Institute of Documentation has been working for forty years for this organization as a whole. By its contribution to the elaboration of documentary technique in all its aspects it has opened up the channels of universal coöperation. Other international organizations such as the International Federation of Librarians Associations are also working towards this end. Of late, the International Institute of Intellectual Coöperation has taken a hand by opening an enquiry, followed by a report, of the various aspects of documentation. There are big international associations also striving to organize documentation within their respective domains. Powerful specialist documentary organizations have been set up at the request of institutions such as the International Labour Office, the International Chamber of Commerce, the International Institute of Agriculture, the International Office of Chemistry, the Peace Palace. These indicate the possibilities.

" 'Nevertheless, coördination, coöperation, joint and unified proceedings are still slow, whereas research workers demand the maximum efficiency in what is to be used by all as an intellectual tool.

" 'For these reasons it has been suggested that a meeting be organized in Paris, in 1937, under the auspices of an International Committee of Documentation, to set up some kind of Parliament of Documentation formed by all the groups and organizations concerned, which would retain intact their independence and autonomy. The purpose would be to hold an enquiry into the existing state of things, and to permit of an examination of principles, programmes and methods, as well as exchanges of views in the various results obtained, to attempt to draw up a minimum plan of work and service, and make a collective general agreement to uphold any decisions made.' "

BOOK REVIEWS

Antiquities of the New England Indians. CHARLES C. WILLOUGHBY. (Peabody Museum of American Archaeology and Ethnology, Harvard University, 314 pp., 146 text figures, Cambridge, 1935.)

This work by Mr. Willoughby, Director Emeritus of the Peabody Museum of Harvard, is, in its gold-stamped blue-cloth cover, a handsomely made book, printed in clear Old Style type on semi-matte paper, and profusely illustrated with superb drawings and a few good photographs. Written in direct and simple style, it offers easy and interesting reading both to the professional and amateur archaeologist, and will doubtless be in wide demand, as the first comprehensive survey of New England archaeology, to the still larger group of those interested in the Indian background of New England.

It consists of four sections entitled, "The Pre-Algonquian Group," "The Old Algonquian Group," "The Algonquian Group in General," and "The Later Algonquian Group." Mr. Willoughby's reason for this somewhat arbitrary classification is alluded to in the short "Supplement." where he says (p. 307), " . . . it may be well to emphasize the fact that the basis for classification in the foregoing pages is almost wholly material from graves, supplemented to some extent by objects of corresponding types from various sources, but largely obtained from fields during their excavation." In this statement one sees both the strength and weakness of the book. Insofar as the author has segregated his material on the basis of grave finds, defining his congeries from a series of cemeteries linked culturally by the presence of an ample number of characteristic common traits, he has doubtless presented a picture of discrete culture entities; but when he includes a host of other objects, not, however, as he says, of corresponding types, obtained from surface collections made over a wide area, this picture is obscured to a degree seriously impairing its value to the critical student.

For example, in the pre-Algonkin group, which is constructed about the Red Paint culture, known from Messrs. Willoughby's and Moorehead's explorations of some twelve cemeteries in Maine, he places the relatively broad-bladed and often serrated-tanged ground slate point (fig. 32) and semi-lunar knife (figs. 43 and 44), also of ground slate, found as surface strays over most of the northeastern area, although not one of these has ever been taken from a Red Paint grave (pp. 52–54, 70–75). Similarly, the bannerstone as a class (figs. 37–42) is listed as a Red Paint artifact (pp. 60–70), when actually but two or possibly three types (figs. 38, 40, 42?) have been found in hematite deposits in Maine. As is well known, most of the forms illustrated have a wide distribution over eastern North America.

His authority for assigning to the Red Paint category such objects as the adze blades (more accurately gouges; figs. 20–22); the effigy pendants (fig. 29); the slate knives (fig. 35); and the bow-drill rests (fig. 47), all surface finds, is

equally equivocal. To say, as he does of certain of these adze blades (p. 38), that they "are from graves which are undoubtedly pre-Algonquian," or that the semi-lunar knives are "undoubtedly pre-Algonquian" (p. 72), seems hardly sufficient to establish the fact.

Several other statements in this section are open to grave question. How, for instance, in a Red Paint "grave" in which "no fragment of bone nor particle of bone dust was found nor could the line of demarcation between the disturbed and undisturbed sand be determined," was it possible to ascertain that "the body had been deposited in a horizontal position in a grave about two feet deep, red ochre placed over the head and over a part of the body and a spear laid in the grave with the slate point near the head?" (p. 56). Again, it appears to be an imposition on the imagination to assume, as Mr. Willoughby has done (pp. 41, 48, 69), that because certain plummets, or as he calls them, pendants, and a bannerstone have come to light from the lower levels of shell heaps on the Maine and Massachusetts coasts, the basic layers of some of these middens were accumulated by the pre-Algonkin predecessors of the later Algonkin people, especially in view of the fact that pottery, unknown from the pre-Algonkin culture, occurs throughout the shell heaps (Moorehead; see contradiction in Willoughby, p. 202, lines 14–18, and p. 205, lines 16–20), and has been found with plummets in the Golden Cove shell heaps, as is indirectly recorded by Mr. Willoughby himself (p. 48, lines 1–7, and p. 205, lines 16–20). The Phillips Academy collections at Andover, often referred to by Mr. Willoughby, show the association of pottery and plummets at Leach's and Von Mach's shell heaps; while another instance is described by John Robinson (*Openings of a Newly Discovered Shellheap at Ipswich*, Bull. Essex Institute, Vol. 14, Nos. 7–12, 1882, pp. 158–163) from Perkins Island, Ipswich, which Mr. Willoughby cites as an instance to the contrary (p. 41). Recently, Byers and Johnson have confirmed this association at the Blue Hill shell heap (1936). Moreover, neither the plummets nor the bannerstone he alludes to are diagnostic traits of the Red Paint culture. One is also inclined to be skeptical of the oft repeated allegation, made here and in the following sections, that the numerous random surface finds described were doubtless ploughed from graves.

Mr. Willoughby is probably in error when he says (p. 16): "Implements belonging to this old culture [i.e., Red Paint] are found in all our New England states and in the adjacent territory as shown on the culture map (Figure 1)," and the reviewer can see no valid reason for attributing the site explored by Hawkes and Linton on Rancocus Creek, New Jersey, to this horizon (p. 30).

In his discussion of pre-Algonkin cutting tools (pp. 31–41) Mr. Willoughby makes no mention of the presence of the ungrooved axe or celt. Dr. Moorehead describes and illustrates a number of "hatchets" in his *Archaeology of Maine;* they may be seen in the Red Paint collections at both Andover and the Peabody Museum at Cambridge, and Mr. Willoughby himself enumerated them among the Red Paint types in an earlier publication (*Prehistoric Burial Places in Maine*, Peabody Museum Papers, Vol. 1, No. 6, 1898).

The second section of the book, "The Old Algonquian Group," is written around a number of cemeteries dug out, with few exceptions, years ago by laborers in Massachusetts, Vermont, and Connecticut. Nevertheless, the evidence seems sufficient, as supported by a number of discoveries in New York, to substantiate essentially the trait complex described by Dr. Willoughby in this section. That he recognizes the incompleteness of this congeries is evident from his statement on page 88. Although the reviewer agrees with Mr. Willoughby as to the western derivation of this manifestation, he is not convinced by the arguments advanced to identify the authors as remnants of the descendants of Hopewell people who were driven to the east (pp. 305–306).

The third section, "The Algonquian Group in General," is really a catalogue of artifact types found in New England and not previously described in the book. Mr. Willoughby has, however, omitted a careful treatment of many important classes of small stone and bone artifacts. Some of the material is obviously the work of earlier, some of later groups. Much of it is the product of the littoral shell middens which Mr. Willoughby well describes. The relationship of the makers of these shell heaps to the previously described groups has not yet been clearly established. The discussion of pipe distribution (pp. 181–190) is notably feeble, and the analysis of pottery types somewhat general and incomplete (pp. 190–200).

The final section of the book, "The Later Algonquian Group," is doubtless the most valuable. The assembled records of the contact period burials, the historical data, and the description and illustration of various techniques will be gratefully received by all students of northeastern archaeology.

Perhaps the most serious criticism of the work as a whole is the limited viewpoint of the author, whose theoretical position takes no cognizance of the bulk of the archaeological literature pertaining to the northeastern area.

WILLIAM A. RITCHIE

La Civilización Chaco-Santiagueña y sus Correlaciones con las del Viejo y Nuevo Mundo, Tomo Primero. EMILIO R. and DUNCAN L. WAGNER. (Compañía Impresora Argentina. Buenos Aires. 1934.)

In the northern central section of the Argentine Republic is the proviince of Santiago del Estero. Part of this province lies between two rivers, the Dulce and the Salado, and is called the Mesopotamia-Santiagueña. Here the Wagner brothers have been excavating since 1927 in a rich archaeological field. As a consequence they have formed a local museum for their collection, and published an elaborate volume on their work.

The present volume is composed of 548 quarto pages, and contains 3 plans, 732 text figures, and 106 full page plates, 45 of which are in three colors. It is without exception the most thoroughly illustrated account of a limited archaeological region yet to be published on the South American field.

The sites where the Wagners have excavated are composed of many small dwelling mounds arranged in irregular chain formation and interspersed with

depressed areas which probably served as water holes. Maximum size of a mound is given as twenty-five meters wide, fifty meters long and three to four meters high. Excavation of a mound furnishes dwelling-site refuse material and rarely burials. Cemeteries of urn burials have been found.

The collection includes great quantities of pottery, from simple utilitarian dishes to elaborately decorated burial urns. Clay animals and figurines are numerous and amusingly modeled. The figurine dolls are flat, ginger-bread-like cutouts, with appliqué button eyes and nose, but often without mouth or forehead. Bone and stone are also used for tools and ornaments.

The pottery is painted in two or three colors, either black and red or black, white, and red. Punch and incision are used for decoration also, augmented with modeling and appliqué strips and buttons. The detail of the decoration is interesting and well illustrated in the book, especially the small modeled adornments for the rims of vessels. The painted designs cover a wide range of subjects, such as birds, serpents, jaguars, human figures, and various geometric patterns.

The Wagner brothers divide the pottery into two branches, an "A" and a "B" style. Generally speaking, the "A" branch is decorated with punch and appliqué, and the "B" with polychrome painting. Other differences in shapes of vessels and subject matter of designs are indicated. The two styles are found mixed in some of the mounds, isolated in others. No implication of chronology is given, and even the two styles are not distinct enough to carry the division throughout the book.

While the Wagners make comparisons of the Chaco-Santiagueña civilization with other civilizations in the Americas and the Old World, it would be sounder from a strictly archaeological view to concentrate on comparisons to the nearby archaeological section of the Northwest Argentine which has very similar material. The Chaco-Santiagueña presents interesting local developments of the Argentine material, but extra-continental comparisons are hardly necessary to explain them.

The merits of the volume from the point of view of presentation of graphic material are outstanding, and the work of the Wagners may be considered as a contribution to the better understanding of Argentine and South American archaeology.

WENDELL C. BENNETT

Archaeology of South America. J. ERIC THOMPSON. (Field Museum of Natural History, Anthropology Leaflet 33, 160 pp., 12 plates, 18 figures, 1 map, Chicago, 1936.)

The difficulties of writing a semi-popular account of any large subject, in a condensed but comprehensive fashion, are apparent. Most likely the specialist will be disappointed and the general reader might feel overwhelmed.

In the case of South American archaeology our knowledge of the eastern part of the continent is scanty. Geographical features were not conducive to

the creation or preservation of spectacular cultures nor to archaeological research. Consequently museum collections for wide areas are minimal, and Thompson's account originated from a background and as a guide to the collections of the Field Museum of Natural History in Chicago. Thus it happened that the author dealt only with western South America, an area characterized by the maize-potato-quinoa complex in contrast to the manioc base in the east. Thompson promises a future account of South American ethnology. However, a short chapter on the archaeology of Bolivia and the Antilles should have been incorporated in this volume.

So far as Thompson's account goes, it exceeds by far the requirements of an occasional museums-visitor, and some definite ideas interspersed with the factual narration make the booklet well worth reading. The first thing one notices is the arrangement of the book. Although a Mexicanist by his prior work, Thompson reiterates time and again his opinion that the cultural flow went from South America to Middle America. In conformance herewith he starts with southern Peru and ends up with Colombia. Thompson stands not alone in this rather recent change of mind. Kidder and Sauer, in two suggestive papers published in *Essays in Anthropology in Honor of A. L. Kroeber*, argue for a similar stand. It must be recognized, however, that the common denominator for this attitude is not so much any evidence for an early diffusion from South America but rather the lack of finding early primitive cultures in Central America. In this respect Thompson's point also seems to be insufficient. He states that mammiform tetrapods are diagnostic of early cultures in Central America, but associated in Colombia with middle cultures; therefore, he argues, the early South American cultures must antedate the early Central American cultures. Unfortunately, we have very little in the way of a chronology in South America. Furthermore, supposing that mammiform tetrapods originated in Central America, we would have to allow time for their diffusion, which might account for their later appearance in South America. On the whole, Thompson is inclined to credit South America with the origin of various pottery traits, such as negative painting and the annular base. Supported by the criterion of quantity, he holds Ecuador for the center of origin, from whence these traits were transmitted to Colombia and Mexico. Thompson also suggests the possibility of manioc having been cultivated before maize, the seedless pineapple testifying to a very old plant-cultivation in eastern South America.

Other traits which were diffused from South America, although in comparatively late times, are the hammoc and metal working. Objects found in the Sacred Cenote at Chichen Itza clearly bear the stamp of South American workmanship. Gold crowns have been found from Peru, Colombia and Mexico. In Thompson's opinion, metal working originated in Peru. He disputes Rivet's theory of an eastern origin for gold, on the ground of its occurrence in early Peruvian cultures, which probably go back further.

Being familiar with myths and rites in Mexico, Thompson enumerates a number of interesting parallels found in South America. The story of the

earthquake god being trapped in a cave occurs in the Maya area and in Peru, as also a story of creation. The sacrifice of a dog as guide to the next world appears in Mexico and Peru. Children were induced to weep before being sacrificed in Mexico and in the Diaguite area. To name children after the day of their birth was customary in coastal Ecuador and in Mexico. The bearded culture hero, Bochica in Colombia and Quetzalcoatl in Mexico, offers another example of close resemblance. The rainbow was the deity of childbirth among the Chibcha and the Maya. The god of festivities was at the same time the patron of the weavers in Mexico as well as in Colombia. Thompson calls this association fortuitous. However, festive garments were a part of the celebrations and therefore this association does not seem too far fetched.

Some errors have slipped in. Thus the statement that the natives of Tierra del Fuego had practically no social organization is misleading, as accounts by Gusinde, Koppers and Lothrop bear out. That agriculture was less widely spread 3,000 years before the discovery, seems rather definite, especially if the spread of maize was rapid, as Thompson assumes. The statement of three main stocks from which all Indians have descended is too ambiguous. The author assumes a rather evolutionistic attitude in claiming that the Amazon area of 10,000 years ago must have resembled Tierra del Fuego of today in cultural level. Then again he utilizes the theory of psychic unity in assuming a comparative isolation of the ancient Peruvians. Their cultural attainments would seem, however explained, easier by outside stimuli, whereas the lack of development of the Fuegians could be ascribed to isolation. Thompson says the earliest datable cultures in South America possessed pottery. No dates have as yet been established for South America, and sites like Taltal had a pottery-less stage. Thompson implies that ball games might have originated in South America. Recently ball courts have come to light in the Southwest, datable about 700 A.D. Should these owe their existence to a diffusion from Central America, a fairly early time for them in this area would have to be assumed.

In speaking of Peru, Thompson quotes correctly: "The perfect thread is not to seek, but has been made." However, he errs by saying tapestry was unknown in Early Nazca (cf. L. M. O'Neale and A. L. Kroeber, *Textile Periods in Ancient Peru*, Univ. Calif., PAAE 28, No. 2, pp. 30–32, 1930). Furthermore, he states that sleeves went out of fashion in Inca times. According to Montell this was rather a matter of regional differences, sleeveless shirts being found in the Highlands and shirts with sleeves on the Coast. Thompson wonders that Chimu and Nazca, only 500 miles apart and presumably about contemporaneous, differed so much. Geographical factors seem to have favored an east-west intercourse more than relations between north and south. The myth of the revolt of the utensils, depicted on the walls of the Pyramid of the Moon in Moche, is also reported by Avila (ch. 3) from Huarochiri.

From the Diaguite area Thompson reports closely adjacent buildings; Bennett found a similar situation on the island of Pariti in Lake Titicaca. The

especially high and diversified development of bronze in the Diaguite area is ascribed to transmission from Peru. The Santa Maria pottery is classified by Thompson as geometric and naturalistic. The latter term should be supplanted by "denaturalized," in contrast to the curvilinear Draconian pottery of the same area.

In Ecuador Thompson deals with six highland tribes and thereafter briefly with the coast section. The prehistoric working of platinum on the north coast and the finding of a mastodon associated with stone implements in the south remain unreported.

Concerning Colombia Thompson regrets that, due to the judging by archaeological standards, the lack of stone structures has led to an underrating of this important link between Peru and Mexico. He explains the lack of bronze in Colombia as due to the lack of tin. The principle of alloying was well known and practiced in Colombia. Thompson mentions six culture centers in Colombia. As noted for previous chapters, the description of single areas is not too well organized. Additional tribes are named without reference to any area, and frequently it remains unclear to which tribe a description of cultural traits refers. The bulk of the material however applies to the Chibcha, notwithstanding the fact that Thompson calls the Tairona the best known tribe. The author mentions various traits of southern provenience, as coca, potato, quinoa, tumbago (an alloy of gold and copper), negative painting, and child-sacrifice. According to the criterion of quantity, tumbago could be possibly of indigenous origin. The last two traits mentioned are of such a wide distribution that at present the evidence for a southern origin seems insufficient. As features of eastern origin, Thompson mentions: manioc, pineapple, hammoc, penis-gourd, poisoned darts, rubber, blow gun, suspended hollow-log drum and others. No mention of the Goajiro and Kagaba Indians is made.

Concluding, Thompson makes the appeal, not only to acknowledge the contributions of prior civilizations in the field of material culture, but also to utilize the insight, which for instance the Incas might offer us in the field of sociology and economics. He also offers food for thought in questioning our tendency to credit the center of high civilizations with inventions possibly made elsewhere.

The figures and plates show some representative samples of material culture. A scale, denoting actual size, accompanying the plates would be helpful, particularly in case of plate XI.

To the literature of a more general character could profitably be added:

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ECUADOR

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JIJON Y CAAMANO, J.: Additional literature.
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COLOMBIA

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Archaeological Studies of the Susquehannock Indians of Pennsylvania. DONALD A. CADZOW. (Publications, Pennsylvania Historical Commission, Vol. 3, pp. 217, 141 plates, 6 charts, 3 maps, Harrisburg, 1936.)

This is the second report issued by the Pennsylvania Historical Commission to describe the archaeological work in the Safe Harbor area which was carried on under the supervision of Donald A. Cadzow. Mr. Cadzow has described the finds as being from seven sites, although the Washington Borough burial and village site, and the Frey Farm burial site probably constitute one component. The Roberts Farm site and the Shenks Ferry site were quite small, so that the majority of the material recovered was obtained from the Schultz Farm, the Washington Borough site and the Strickler site. There is a Foreword by Miss Frances Dorrance, and an Introduction by Mr. Cadzow.

The first thirty pages are devoted to a discussion of the linguistic and ethnological groups which are known to have occupied the general area. The remainder of the report describes the finds at the various sites and is well fortified with 141 plates, one map, and eight charts.

The major part of the section on early history consists of quotations from various authors. The ten page quotation from Streeter's account of the *Fall of the Susquehannocks* is not placed in quotation marks. Mr. Cadzow has called upon various individuals for reports on specialized subjects, the reviewer included. In the report, due to an unfortunate omission of quotation marks, it is not always easy in some instances to distinguish between the opinions of the various contributors and those of Mr. Cadzow. For example, a quotation from Mr. W. C. Orchard is begun on page 131 and continues to page 132. The second and third paragraphs on the latter page are in quotation marks, yet the first paragraph is not, although it is probably from Mr. Orchard's pen. One wonders

if the fourth paragraph should be attributed to Mr. Orchard or Mr. Cadzow. Perhaps the most flagrant example of this failure to fix responsibility is afforded in the sections devoted to a discussion of the physical type and the burials. On page 148, the measurements and observations by Mr. Ritchie (not Richie) probably end with the words "due to infection." On pages 154–155, Mr. Ritchie has contributed additional measurements and indices on two skulls.

The format of the publication is marred by many typographical errors, misspelled words, and faulty use of words. Throughout the publication *Zea mays* is spelled "zia-maize." The brass necklace supposed to be in Plate 40 is not there, and on page 151, the reference to figures B and C of Plate 97 should be reversed. The plates are not arranged in their numerical order on the different pages. The report clearly indicates the author's lack of familiarity with skeletal descriptions, as exemplified on pages 48-49.

There are certain words in common use by archaeologists that are consistently misused in this report. Two glaring examples are "monolithic" and "intrusive." On pages 58, 81, and 152, pottery and antler pipes are spoken of as being monolithic, while the stone pipes described on page 115 have not been called by that term. On page 156, the burials at the Schultz site are "probably intrusive on this village site," yet the artifacts and vessels found with the burials appear to be typical of the rest of the material found. On page 60, a pottery design is called "intrusive." The following quotation from page 81 will illustrate this misuse better than I can describe it, and the paragraph is given in full. "An interesting unfinished winged bannerstone was found on the surface of the site and was unquestionably *intrusive*. A single grooved stone axe, also recorded near the surface of the ground in the general digging, belonged to an earlier period and can be classed with the bannerstone." The antler objects, Plate 117, have commonly been called "flakers" or game pieces.

It would be interesting to know who made the skeletal measurements in the field and what instruments were used. For example, we find on page 50, burial No. 9, that "Field measurements on the skull proved it to be dolichocephalic"; yet, "The skull was thin and crushed on the right side." Burial No. 10, on the same page, has a most unusual deformity. "The left tibia was deformed and attached to the tibia by a solid fusion of bone 3 inches from tarsal surface."

Certain factual statements made in the report should be carefully examined. On page 10, it is said that the chronological sequence in New York of the various Algonkian cultures "has not been scientifically successful because of the lack of accurate archaeological evidence from the area covered by Pennsylvania." The sequence in New York State can be firmly established if evidence for it is found in that state. The extension of that sequence into Pennsylvania, however, depends on field work done within its borders. Mr. Cadzow believes that the Schenk's Ferry site can be roughly equated with the Third Period Algonkian in New York State "with the exception of Burial 1, with its crude tubular pipe which belongs to a more archaic period." Examination of the photograph of Burial 1 clearly shows two other pipes which are typical of the Third Period.

Contrary to the author's belief, triangular arrowpoints are the dominant form on sites of this period, and a goodly proportion of bone artifacts also appear. The type of "placed bone" burial described as a new Iroquois trait appears to be a bundle burial variant, and the long quotation given to support the new trait in the Summary of the Strickler site describes bundle burials which were common to at least two-thirds of the tribes in the Eastern Woodlands. The unidentified quotation from General Clark's notes on pages 94 and 95 was probably taken from Charlevoix, since the Caxton Club edition, 1923, of Charlevoix, pages 178–181, is almost identical with the one taken from Clark.

The reviewer has closely examined in the report and at Harrisburg the pottery and the pipes which, on page 96, Mr. Cadzow attributes to Cherokee influence. I cannot concur in the opinion, nor can I see that the stone discs are "chunkey" stones or that they indicate Cherokee influence. The arrowheads at Washington Borough were not "more like the Cherokee than those found in the north." Nor is there any visible evidence to connect the Susquehanna more closely to the Cherokee than to the north. Ceramically, the Susquehanna are connected with the Mohawk-Onondaga group. Why did the author take his description of pottery manufacture from Dumont's account of the lower Mississippi Valley tribes when Sagard's description of early Huron practice was available? What "dung" was used by the Susquehanna Indians to "bake" their pottery? How could the face effigies on the pottery be used as handles? The "Forms" described at Washington Borough might better be called decorative styles, since the actual form of the vessel varies but little. None of the vessels in the collection at Harrisburg showed the use of a "pot comb" (page 123). The ceramics at Washington Borough were not more "archaic" (page 132) than those at Strickler. Antler pipes have been found previously on Iroquois sites, although perhaps not in Pennsylvania.

It is a bit difficult to distinquish between the author's net-sinkers (page 149, Plate 95, page 195, Plate 136) and pot covers (page 151, Plate 135). That the "net-sinkers" were bolas stones is of considerable interest. The "wrist-guards" of Plate 120 are quite similar to the comb blanks of Plate 84. The *Olivella mutica* beads are found on late historic Iroquois sites in New York. For years, archaeologists familiar with the Iroquois area have recognized that harpoons were common on both historic and pre-historic Iroquois sites.

The purpose of the excavations recorded in this report, as set forth in the Foreword, "was primarily for the purpose of establishing an occupation contemporary with the petroglyphs." Evidence of this nature was not found. All of the sites contained more or less historic material. The reviewer believes that the relative chronology established by Mr. Cadzow for his three major sites is probably correct. It seems, however, that the author tended to give them the maximum age, whereas I would suggest the minimum. The change in ceramics between the earlier historic Schultz and Washington Borough sites representing relatively pure Iroquois on the one hand, and the late historic Strickler site showing definite Woodland influence, is so pronounced as to suggest that pos-

sibly the Strickler site represents the Susquehannock occupation after their return from Maryland and Virginia. The fact that there are very few artifacts of Indian manufacture at this site would tend to support this idea.

The photographs of the field technique show that restricted vertical excavation was exclusively employed. This may account for the failure to find the outlines of the house structures and the forts which are mentioned in the report. One post hole mentioned on page 163 was three feet in diameter and one foot ten inches deep. Only rarely are the photographs of the artifacts and the pottery identified as to their provenience within the site.

The author's theories as to Iroquois migration are also open to question. In common with many eastern workers, Mr. Cadzow states that the Iroquois moved into New York and Pennsylvania from the middle Mississippi Valley. The logical route is, of course, up the Ohio River. As far as the reviewer is aware, there is no evidence of an archaeological or ethnological nature to support this contention. There is no evidence that the Cherokee lived in Ohio. The Cherokee could hardly have been driven away from the Ohio Valley in 1698 by the Delawares when they had been living in the Tennessee-North Carolina area for years before that. The Cherokee have traits in common with the Iroquois, but they hardly "had a typical Iroquoian culture." What evidence is there for Mr. Cadzow's migration of the Susquehannock up the Youghiogheny through the Pennsylvania mountains, down the Potomac to Chesapeake Bay? Excavations in western Pennsylvania do not support this contention, and there is very little Iroquois evidence in the Potomac valley.

The report does throw considerable light on the Susquehannock occupation of the lower Susquehanna Valley, and for that reason archaeologists will want to have a copy for reference. Mr. Cadzow says many non-professionals have excavated in this area and are still doing so. The results of their work have not been published.

The reviewer regrets that he has had to prepare so critical a review. The large amount of material recovered will be of considerable value for future comparative studies. The report has helped to clarify the picture of Iroquoian occupation in Pennsylvania, and provides a good example of archaeological acculturation. One of the most interesting points is that pottery seems to have been one of the last material culture traits to be abandoned. Future reports by the Pennsylvania Historical Commission, describing archaeological activities which have been carried on continuously since the Safe Harbor excavations, will be awaited with a great deal of interest.

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Brooklyn Museum Library	Brooklyn, N. Y.
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Columbia University Library	New York City
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Connecticut State Library	Hartford, Conn.
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Museum of New Mexico	Santa Fe, N. M.
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Science Service	2101 Constitution Ave., Washington, D. C.
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Smith, Frederick	5640 Guilford Ave., Indianapolis, Ind.
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Sweet, Sidney R.	Bridgeport, Neb.
Taylor Museum	West Dale Street, Colorado Springs, Col.
Temple, Laura	3—A Serapio—Rendon 76, Mexico City, Mexico
Teyen, G. M. W.	Public Museum, Milwaukee, Wis.
Thomas, J. E.	Warner Place, Nashville, Tenn.
Thompson, Raymond	Judith Gap, Mont.
Thomson, Francis A.	School of Mines, Butte, Mont.
Thomson, M. S.	1814 Barrett St., Sheboygan, Wis.
Throop, George R.	Washington University, St. Louis, Mo.
Thurston, Mrs. Bertha Parker	c/o Southwest Museum, Los Angeles, Calif.
Ticer, Will	Route #4, New Albany, Miss.
Titterington, P. F.	212 Metropolitan Bldg., St. Louis, Mo.
Torrey, Howard	247 Summer Ave., Reading, Mass.
Trik, Aubrey S.	North Wales, Pa.
Tulane University, Dept. of Middle American Research	New Orleans, La.
Tulsa Public Library	Tulsa, Okla.
Turney-High, Harry	State University, Missoula, Mont.
Tyzzer, E. E.	Harvard Medical School, Boston, Mass.
Underwood, Thomas R.	Lexington Herald, Lexington, Ky.
University of Alaska Library	College, Alaska
University of Arkansas General Library	Fayetteville, Ark.
University of California Library	Berkeley, Calif.
University of Chicago Library	Periodical Dept., Chicago, Ill.
University of Colorado Library	Boulder, Col.
University of Denver, Mary Reed Library	Denver, Col.
University of Kentucky Library Department	Lexington, Ky.
University of Missouri General Library	Columbia, Mo.
University Museum, University of Pennsylvania	Philadelphia, Pa.
University of Nebraska Library	Lincoln, Neb.
University of New Mexico Library	Albuquerque, N. M.
University of North Carolina Library	Chapel Hill, N. C.

University of Notre Dame Library	Notre Dame, Ind.
University of Oregon Library	Eugene, Ore.
University of Texas Library	Austin, Texas
University of Washington Library	Seattle, Wash.
Valcarcel, Luis E.	Museo Nacional, Av. Alfonso Ugarte, Lima, Peru
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Washington University Library	St. Louis, Mo.
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Willey, Gordon R.	Y.M.C.A., Macon, Ga.
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Willoughby, C. C.	Peabody Museum, Harvard, Cambridge, Mass.
Wilson, J. Cameron	365 Dundas Street, London, Ontario
Windsor, W. C.	Citizens National Bank Bldg., Tyler, Texas
Wissler, Clark	American Museum of Natural History, New York City
Witte, A. H.	Henrietta, Texas
Wolff, Eldon G.	Public Museum, Milwaukee, Wis.
Wood, Erwin F.	616 N. Lake Street, Madison, Wis.
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Woodward, Arthur	Los Angeles Museum, Los Angeles, Calif.
Woolford, Sam	433 Argo, San Antonio, Texas
Wormington, Marie	Colorado Museum of Natural History, Denver, Col.
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